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No. 5.—SYMPOSIUM ON DISEASES OF SHEEP*

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What proved in the event to be a well-justified venture of faith on the part of the Provisional Committee—selection of the subject of diseases of sheep and the allocation of a full session of Congress to their discussion—was inaugurated with promise by the presence of a full attendance of members at the Technical College on the morning of Thursday, September 7th. The conduct of the proceedings was in the experienced hands of Dr. R. F. Montgomerie, B.SC., F.R.C.V.S., Senior Vice-President of the N.V.M.A.

The CHAIRMAN: I have great pleasure in calling this Session of our Congress to order. The Association is very fortunate in that four gentlemen distinguished in this field have consented to combine in the preparation of this symposium. Personally, when the proposition was first made and before the names were announced, I thought it a physical impossibility to get four experts to come together on a common platform. When the speakers were chosen —and I have the good fortune to know each of them quite intimately—I realised we would have a symposium of quality, and without any difficulty. I am sure the majority of you have read it very carefully, and I will call on Dr. Jamieson to make his opening remarks.

Dr. S. JAMIESON: I believe very strongly that when the written word is written it is best left alone without any addition, but there are one or two points I would just like to stress. The important one in my experience is that blackquarter in sheep is no longer synonymous with *Clostridium oedematiens* infection, and we do know that there have been opinions that *Cl. oedematiens* infection in sheep is a problem from start to finish. I might appear in this paper to elaborate *Cl. oedematiens*, and I am conscious that it has been a very good friend of mine for a number of years, but I am convinced from the work that has been done that it is an infection to which we must in his country pay a great deal more attention, and be always on our guard that in anaerobic infections we are not dealing with *Cl. oedematiens*, either as a simple infection or combined with others.

The only other point is this debatable question of enterotoxaemia. I am strongly of opinion that if there is a disease within a sheep which needs re-investigating, it is this clinical condition of enterotoxaemia. I have described here the confusion where toxin is absent and the clinical syndrome is that of toxaemia where toxin is present and the clinical syndrome is absent. I think it is one of the most important diseases of sheep, and from our observations must be thoroughly re-investigated to establish if we are right in our belief on the aetiology and the development of the condition.

I do not intend to say any more.

Mr. L. E. HUGHES: Both Jamieson and I have stressed the difficulties encountered in diagnosing with certainty the various enterotoxaemias.

I would like to draw your attention to the table setting out the diseases we meet in Mid. Wales, in which I have attempted to indicate their relative importance. You will notice the absence of parasitic gastro-enteritis amongst hill flocks; although it may occur at certain times of the year in sub-clinical forms we do not regularly encounter in hill sheep the severe train of symptoms seen every year in lowland sheep where the animals are obviously dying from parasitic gastro-enteritis.

Earlier in the week Mr. Hignett suggested the calcium-phosphorus ratio might be influenced by adding excess lime to pasture. We find in Mid. Wales that the balance of trace elements may be affected by excessive liming. Thus on certain fields on farms in the area the *p*H may be in the region of 5·4 to 5·7 where the addition of calcium to the soil would be helpful, but if the farmer added sufficient lime to correct the lime deficiency he would probably increase the incidence of pining which is known to exist amongst the lambs grazing these pastures.

Finally, I would like to plead that we go back to some extent as far as enterotoxaemia is concerned. We know a good deal about the bacteriological aspects of it, including something of the parts played by the toxins types B, C and D, but we know nothing of the predisposing causes. As it is not an infectious disease and cannot be reproduced experimentally it will prove a difficult piece of work to find out why it occurs at certain times of the year and on certain types of pastures or perhaps more correctly on pastures at certain stages of growth.

Mr. W. T. ROWLANDS: May I express my pleasure at having been asked along with my colleagues to present a symposium on sheep diseases. The only regret I have is that at least one practising veterinary surgeon was not included.

My feeling is, speaking from experience in North Wales, that in the last few years practitioners have indeed taken an interest in sheep. The individual sheep now has a

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value more than in the past when the investigation into the cause of death of an individual sheep was not considered worth while. It is good that in Wales in particular you should have a paper on sheep diseases, and I make no excuse for introducing the only Welsh word you will hear spoken during the Congress week, that is "breid." I have used it to serve as an example of the need for complete diagnosis in relation to the treatment of sheep diseases in particular. Until we can get an accurate diagnosis, the treatment of disease will be far more difficult than we appreciate. It is that which led me to introduce you to the work done on this rather complex subject of breid in sheep.

Mr. J. T. STAMP: One of the openers to this discussion made the suggestion that all the sheep diseases came from Scotland into England and then into Wales. In defence of Scotland I would like to say that the abortion due to *Vibrio foetus*, and the abortion due to *S. abortus ovis* do not occur in Scotland; they occur in England and maybe in Wales. Therefore, there are many people who know a great deal more about these two infections than I do, because they have had more opportunity of seeing them than I have.

The type of abortion in which I am interested is the one which has been known for a good number of years as enzootic abortion. The cause of it has just been found, and almost certainly delegates from England and Wales will have to consider whether this condition may occur down in Wales and in England as well as in Scotland. I find it difficult to imagine why England and Wales should not have this enzootic abortion when more or less the markets from which they draw supplies are so rich in the infection.

I would only add one more remark with reference to enzootic abortion. Since this paper was written, Dr. McEwen, of Moredun, and myself have found that egg yolk vaccine appears to be fairly efficient in the prevention of this condition.

The CHAIRMAN: After those admirable summaries from the four gentlemen, we will call on the opener, Mr. Davies. He has had a long experience and some practice on the laboratory side of sheep diseases.

The papers under discussion were as follows:—

RECENT INVESTIGATIONS INTO CERTAIN DISEASES OF SHEEP

BY

S. JAMIESON

It is the aim of this symposium to present information which has been established by observation and experiment but is not as yet generally available to veterinary practitioners. For that reason this paper is composed of recent information concerning unrelated diseases.

STREPTOCOCCAL INFECTIONS

Infection of lambs with streptococci of an antigenic type within Group C has been reported by Blakemore, Elliott and Hart-Mercer (1941). The disease produced is a suppurative polyarthritis (joint ill) with or without endocarditis. The condition is now recognised as an important disease of lambs, widespread throughout the country and offering in the early stages a reasonable opportunity for chemio-therapy.

Recently in the north of Scotland a disease of lambs due to infection with *Str. faecalis* (Jamieson and Stuart, 1950) has been recognised. Clinically this disease differs from that arising from infection with Group C *Streptococci*. There are no joint lesions and experimentally it has not been possible to reproduce lesions in the joints of rabbits or sheep using strains of *Str. faecalis*. The disease takes the form of a vegetative endocarditis affecting the tricuspid and bicuspid valves of the heart. The condition has been observed in lambs about six to eight weeks old, but isolated cases also occur in lambs two to three weeks of age.

The symptoms of bacterial endocarditis may be such that the disease can be suspected during life. In those cases the affected lamb shows lassitude and cardiac irregularity with some respiratory upset. In the majority of cases, however, death is sudden and symptoms are not generally observed. At *post-mortem* examination lesions are confined to the heart valves and unless this organ is incised the condition can easily be overlooked.

There does not appear at the moment to be any successful therapeutic treatment. All the strains of *Str. faecalis* isolated are quite insensitive to penicillin and the clinician is handicapped by the vagueness of the syndrome. All the evidence at present collected suggests that infection is most likely to occur in lambing-pens and paddocks used by sheep for some years in succession.

PNEUMONIA DUE TO *Str. faecalis*

In hill flocks in the north of Scotland outbreaks of a type of pneumonia not previously described have been recognised. The disease usually affects less than 5 per cent. of the flock, but appears invariably to be fatal. From these cases *Str. faecalis* has been isolated in pure culture from the lungs, spleen, liver, bone-marrow and heart blood.

The onset of the disease is sudden and the chief symptom is accelerated respiration. In the early stages of the disease the affected animal stands with its forelegs well extended, but it soon becomes recumbent. The temperature may reach 107 to 109° F. The animal dies within three to four days after the appearance of symptoms.

At *post-mortem* examination there is a diffuse pneumonia with a slight fibrinous pleuritis. Adhesions are uncommon and fluid in the pleural cavity is scanty. The carcase presents a mild septicaemic appearance and occasionally small petechiae are present on the surface of the heart and spleen.

DISEASES DUE TO ANAEROBES

Clostridium oedematiens

The recent appreciation that black disease in sheep is of widespread occurrence in this country (Jamieson, Thompson & Brotherston, 1948) and the isolation of a type D strain from bovine species (Soltys and Jennings, 1950) suggest that disease due to this anaerobe is probably more prevalent than was believed formerly. The widespread dissemination of latent spores of *Cl. oedematiens* in normal healthy livers supports this belief. Thus, Jamieson, (1949) surveying the incidence of latent spores in healthy livers isolated *Cl. oedematiens* from 28·9 per cent. sheep livers and in seven out of 23 cattle livers examined. The organism was also recovered from the livers of rabbits and crows. It was also shown that in black disease areas the incidence of *Cl. oedematiens* spores was higher than in areas in which

black disease had not been recognised. The conditions due to infection with *Cl. oedematiens* have been studied since in black disease areas.

1. Blackquarter Due to *Cl. oedematiens*

In this country *Cl. oedematiens* infections in animals were rarely reported in cattle and sheep (Bosworth & Jordon, 1929; Roberts & McEwen, 1931; McEwen, 1931). Since 1945 I have investigated eight outbreaks of blackquarter in sheep due to *Cl. oedematiens* infection. These outbreaks, confined chiefly to lambs, occurred on black disease properties, and the nature of their pathogenesis and the apparent purity of infection stimulate interest in our conceptions of anaerobic infections in sheep.

Blackquarter due to *Cl. oedematiens* infection occurs chiefly in lambs following castration and docking. In all the outbreaks I have investigated the Burdizzo method of castration has been used. The typical history is that lambs are found dead 48 hours following the operation and losses in some outbreaks have reached 30 per cent. An interesting feature is that ewe lambs which were handled also developed the disease.

The lesion of *Cl. oedematiens* blackquarter is free from crepitation and is usually found in the major muscles of the hind or fore limbs. The external manifestation of the lesion is a soft, extensive swelling which on incision reveals a bright red muscle, infiltrated and surrounded by a clear gelatinous exudate.

From the lesion *Cl. oedematiens* can be isolated in pure culture. On complete *post-mortem* examination the affected animal shows the characteristic changes associated with *Cl. oedematiens* toxaemia. The pericardium is dilated with clear fluid, there is intensive pyloric inflammation, and small subserous petechiae may be evident. The peritoneal cavity usually contains clear fluid.

A similar disease has been observed in young calves following inoculation with *Cl. chauvei* vaccine on black disease properties, although the vaccine used was not contaminated with *Cl. oedematiens*.

The mechanism of the development of blackquarter under these circumstances is an intriguing one and the suggestion of Albiston (1937), when examining outbreaks of blackquarter due to *Cl. chauvei*, that the condition is in fact due to the activation of latent spores in the musculature by vaccines prompted an experimental investigation.

Experimental

Guinea-pigs.—Six guinea-pigs were given doses of toxin-free spores of *Cl. oedematiens* by the intravenous, intraperitoneal and oral routes. The doses varied from 10 to 100 million spores. These animals remained healthy and 50 days later *Cl. oedematiens* was recovered from the liver, spleen and bone-marrow.

Sheep. *Experiment* 1.—Ten million toxin-free spores of *Cl. oedematiens* were injected intramuscularly into an adult sheep in good condition. Sixty days later the sheep was slaughtered and *Cl. oedematiens* was recovered from the liver, spleen and the muscle tissue at the site of inoculation.

Experiment 2.—Three sheep were given by intramuscular injection approximately two, four and eight million toxin-free spores of *Cl. oedematiens*. The site of inoculation was the popliteal area, the skin of which was shaved and disinfected. The inocula were placed at a measured distance in the muscle. Sheep No. 1, which had received two million toxin-free spores, was injected three weeks later in the site of inoculation with 0·5 ml. of sterile calcium chloride. No local reaction was observed.

Sheep No. 2 received four million toxin-free spores and four weeks later at the same site 0·5 ml. of sterile calcium chloride. This animal developed a marked oedematous swelling within 12 hours and died in 96 hours.

Sheep No. 3, which had received eight million toxin-free spores four weeks previously, was injected with a similar amount of calcium chloride and died in 96 hours with oedematous blackquarter.

Post-mortem examination of these animals revealed a lesion similar to that seen in naturally occurring *oedematiens* blackquarter.

It appears reasonable to deduce that the pathogenesis of blackquarter due to *Cl. oedematiens* infection is primarily the activation of existing latent spores by any tissue debilitant. In practice, wounds, bruises resulting from rough handling, and the bruising resulting from Burdizzo methods appear to be reliable debilitating agents.

Oedematiens blackquarter in lambs can be controlled effectively by the use of black disease anti-serum and it is strongly recommended that on properties where black disease has been diagnosed this type of blackquarter should be suspected. It seems also obvious that a survey of the causation of blackquarter in this country is desirable in the light of our present knowledge and that, at any rate, in view of the high incidence of latent spores of *Cl. oedematiens* in normal healthy tissues of sheep and cattle, blackquarter prophylactics should contain *Cl. oedematiens* antigen.

2. Bighead in Rams Due to *Cl. Oedematiens*

Bull (1929) in Australia first described the occurrence of this condition, but its existence has not been reported previously in Great Britain.

The disease is characterised by an oedematous swelling of the head, cheeks and lower jaw. The condition develops rapidly and in my experience invariably is fatal. The disease is due to the development of *Cl. oedematiens* in the abrasions sustained on the head and face of rams when fighting. Presumably, however, any abrasion can become infected. *Diagnosis.*—Absolute diagnosis is possible only by careful bacteriological examination of the head. The organism shows few invasive properties under these conditions and its recovery from an affected head is not always easy. *Treatment.*—If a case is obtained in the very early stages, *Cl. oedematiens* anti-serum is useful, although the most effective treatment is to vaccinate all rams with black disease alum-precipitated anaculture.

3. Enterotoxaemia and Pulpy Kidney Disease

Of all the diseases affecting sheep this disease appears to both the clinician and the laboratory diagnostician the most elusive. How many of us have examined *post-mortem* sheep with all the typical findings of enterotoxaemia, but failed to demonstrate filterable toxin in the intestinal tract? How frequently has a potent toxic filtrate been obtained from sheep when clinically the condition has little resemblance to enterotoxaemia or pulpy kidney disease? To increase the confusion there are, in addition, the odd, constantly recurrent, toxic filtrates which are not neutralised by any of the known antisera, and yet no unknown organism is recovered from the bowel contents.

While this is not the place to discuss the reliability or

the rationale of our present methods of diagnosis, I am convinced that on the laboratory and clinical sides of our profession there is a spirit of *laissez faire* in the diagnosis of enterotoxaemic disease. The practitioner pins too much faith upon a kidney which is " pulpy " and the laboratory worker accepts " negative " filtrates too politely.

An example of deviations which occur in enterotoxaemia can be found in three outbreaks investigated in the north of Scotland. All three outbreaks occurred since 1948 on two hill farms where the ewes are folded on turnips during lambing. Enterotoxaemia is not unusual in hill ewes where folding is practised. These outbreaks, however, presented *post-mortem* findings which do not appear to be recorded in the literature.

The clinical syndrome was not distinguishable from the typical enterotoxaemia. The mortality rate in the flocks was from 12 to 18 per cent. On *post-mortem* examination, however, the large intestine and caecum were generously studded with subserous ecchymoses, the heart showed petechiae, and the kidneys presented a slightly toxic appearance.

Bowel filtrates toxic to mice, and neutralised by *welchii* type D anti-serum, were recovered from the contents of the large intestine, whereas the presence of toxin was not demonstrated in filtrates made from the contents of the small intestine. *Cl. welchii* type D was constantly recovered from the large bowel and from the small intestines only in a few of the cases.

In conclusion, I submit that there is no reason to be satisfied that the diseases of sheep are well understood, classified and controlled. Active research into the true causation and the recognition of disease of the sheep is urgently demanding the serious attention of our profession. The anomalies which exist in the classification " enterotoxaemias," and the fact that we have completely failed to reproduce these conditions, appear to me as heavy debits in our scientific endeavour. With a rebirth of the enthusiasm which existed amongst the early workers in this field there must be a concerted effort on the part of our teaching schools to provide more extensive training on the sheep in health and disease than appears at the present time.

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SOME OBSERVATIONS ON DISEASE IN HILL AND LOWLAND FLOCKS

BY

L. E. HUGHES

A great deal is known of the host-parasite relationship in mammals, particularly in relation to those diseases which can be experimentally reproduced; there is no doubt that the spread of many infectious diseases is conditioned to a considerable degree by the dose of the infecting agent, although other variables of which we are only beginning to have any precise conception play an important part. Whether or not pathogenic bacteria set up disease in farm animals is undoubtedly determined to a considerable extent by methods of animal husbandry which influence the environment in which the animals live. Thus on a specialised poultry farm the intensive methods employed result in the crowding together of the host animals under environmental conditions which favour the spread of disease. The presence of a few infected eggs and infected chicks in incubators and brooder houses leads rapidly and without difficulty to an epidemic. Similarly an infectious condition such as laryngo-tracheitis spreads rapidly through a group of adult birds kept under the prevailing systems of poultry husbandry. When animals are kept under less intensive systems the chances of epidemics arising are reduced. This may be illustrated by the fact that tuberculosis, mastitis and some of the other more common diseases of cattle take a long time to spread through a herd and relatively close contact is required for these diseases to become widespread throughout a closed community. If animals are kept under a more extensive system and not housed for long periods the time taken for an infectious disease to spread throughout such a herd is much longer; in fact, it may not spread at all. Tuberculosis is uncommon in herds of cattle which are not housed. The exposure rate plays a most important part in determining the speed at which any infectious disease spreads through a population of host animals.

It is quite obvious that a study of disease is facilitated if the disease under investigation can be reproduced regularly under experimental conditions or even under field conditions. Unfortunately very few of the bacterial diseases of sheep have been reproduced. This fact makes investigations on sheep diseases most difficult and means that a study of the conditions under which they occur is of paramount importance.

In the course of this paper I wish to make a few remarks on some aspects of the disease position in relation to the sheep population in Wales. During the last few years much of my work as a Veterinary Investigation Officer has been connected with hill and lowland sheep and I have formed the impression that, generally speaking, hill flocks are not subject to the same amount of loss from disease as lowland flocks. There do not appear to be many figures in existence to support such an observation, but, thanks to the generosity of Mr. B. H. Roberts of the Department of Agricultural Economics of the University College of Wales, I have obtained data which lend support to this point of view. This state of affairs may not be common to the whole of Great Britain, as we are fortunate in Wales in that louping ill and tick-borne fever rarely occur, and conditions are different from those which obtain in hill flocks in other parts of this island.

Data Extracted from Results of Cost Investigations on Hill and Lowland Sheep

Hill Sheep

Estimates of death rates in lambs are very difficult to obtain because of the problem of ascertaining how many lambs are lost in the first few weeks of their lives. The following ratios are calculated from the best estimates it was possible to ascertain.

TABLE I

Year	Number of flocks	Death rate (%)				Frequency distribution of flocks according to death rates (%)				
		Ewes	Rams	Wethers	Lambs	% 0–5	% 5–10	% 10–15	% 15–20	% Over 20
1945–46 (1946 lamb crop)	48	8½	17	11	5½	40	7	1	–	–
1947–48 (1948 lamb crop)	49	4	8	5	5	29	13	6	–	1
1948–49 (1949 lamb crop)	45	3½	5	4	4	32	10	2	1	–
Totals 1945–46 47–49	142					101	30	9	1	1

If the results obtained for the three years tabulated are taken together it will be seen that of a total of 142 flocks, 141 had losses up to 20 per cent. annually and one only had losses greater than 20 per cent. This means that in an average year few if any hill flocks have losses exceeding 20 per cent.; it will be seen from the table that by far the majority of flocks have losses less than 5 per cent. The losses sustained during 1946-47, a year with exceptionally bad weather, are very different from those experienced in the year 1945-46 and the two years 1947-49.

TABLE II

DEATH RATES, 1946–47 (1947 CROP)

Number of flocks	Death rate (%)			
	Ewes	Rams	Wethers	Lambs
39	50	49	48	50

FREQUENCY DISTRIBUTION OF THE ABOVE 39 FLOCKS ACCORDING TO DEATH RATES (%)

% 10–20	% 20–30	% 30–35	% 35–40	% 40–45	% 45–55	% 55–70	% Over 70
4	1	3	3	6	6	10	6

Table II shows that in a year such as 1946-47 almost three-quarters of the hill flocks in Wales lost more than 40 per cent. of their stocks.

An examination of the frequency distribution table shows that a much larger number of the lowland flocks have annual losses over 5 per cent. and 10 per cent. than hill flocks. It has been noted that very few hill flocks sustain losses in each year greater than 20 per cent.; Table III shows that 21 per cent. of lowland flocks exceed this figure (20 per cent).

It is, on the face of things, most surprising that more than half of the lowland and marginal farms in Wales lose more than 10 per cent. of their flocks per annum, whereas this figure is exceeded by hill farms only under the most exceptional circumstances. The purpose of this contribution is to try to find why, in spite of major disadvantages of nutrition and shepherding, less disease occurs amongst hill sheep in Wales than amongst the flocks on lowland and marginal areas. With this object in view the following table sets out a number of common diseases occurring in both types of flocks in order of importance:—

Hill Flocks	*Lowland and Marginal Flocks*
Tick Pyaemia	Parasitic gastro-enteritis
Braxy	Enterotoxaemia in ewes
Lamb Dysentery	Lamb Dysentery
Gid	Pulpy Kidney
Pulpy Kidney	Pregnancy Toxaemia
Enterotoxaemia in ewes	Braxy
Swayback	Pine
	Swayback
	Gid
	Abortion

The above classification is based upon experience gained during the past seven years which, although considerable, is, of course, not exhaustive; the table is not intended to act as anything more than a rough guide.

It is interesting to note that tick pyaemia is the only disease of hill sheep which is contracted on the mountain itself. The rest arise when the sheep are enclosed on the "ffridd" or lowland farms. Thus lamb dysentery is practically unknown on the mountain, although it does occur in those flocks which are brought down to lamb; the

TABLE III

LOWLAND SHEEP (INCLUDING MARGINAL AREAS)

Year	Number of flocks	Death rate (%)			Frequency distribution of flocks according to death rates (%)				
		Ewes	Rams	Lambs	% 0–5	% 5–10	% 10–15	% 15–20	% Over 20
1945–46 ...	27	15	22	9½	2	9	5	6	5
1946–47 ...	34	15	12	10	5	13	8	4	4
1947–48 ...	31	9	6	18	3	2	7	4	15
1948–49 ...	29	6	10	8½	7	7	10	3	2
Totals	121				17	31	30	17	26

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same is true of pulpy kidney in young lambs. Braxy, pulpy kidney, and gid arise when the ewe or wether lambs are brought down to lowland areas for wintering or fattening. Enterotoxaemia is found in hill ewes brought down from the mountain to enclosed areas for lambing.

The most serious cause of loss in lowland flocks is undoubtedly a form of disease demonstrated by sudden deaths occurring in the ewes in the flock. These losses may occur singly, at short intervals, or a number of animals may be found dead in the course of one, two, or three days. There is no doubt that a percentage of these deaths are associated with *Cl. welchii*, and the toxin of *Cl. welchii* type D, or more rarely type C, may be demonstrated in the small intestine. In other cases, however, it is quite impossible to demonstrate a bowel toxin and in others the bowel contents are toxic to mice but we have been unable to identify the toxin present. It is certain that some of these losses in which animals are found dead, or dying, are due to black disease, which was not recognised in this country until recent years. In the case of lowland flocks these forms of enterotoxaemia occur in the autumn and in the spring; in the case of hill flocks the losses occur when the ewes are grazing lowland pastures at lambing time. Losses occur towards the end of this period, before the ewes return to the hill, and cease when they are moved back to the higher ground. In all cases diseases of this type are most common in seasons of mild weather.

American opinion on this disease differs considerably from the most widely held view in this country, where it is generally accepted that the disease is infectious, caused by members of the *Cl. welchii* group. The aetiology of enterotoxaemia in sheep is not clear and the condition presents many puzzling features. Amongst these is the fact that the disease has not been reproduced, that even in fresh carcases it is not always possible to demonstrate the presence of *Cl. welchii* toxin; again toxin has been demonstrated in sheep dying from other causes; finally, the value of anti-toxin in prevention is circumstantial in that a change in husbandry methods may give as good results. It appears necessary to postulate a predisposing factor or factors in the aetiology of enterotoxaemia. Britton[1] has drawn attention to the similarity of the clinical and biochemical pictures seen in enterotoxaemia and paralytic ileus; this suggestion should receive further attention.

It is commonly stated that enterotoxaemia is more common on new leys than on old pastures and that it is frequently associated with feeding on lush legumes or rape pastures, with over-eating accustomed foods or the consumption of heavy concentrated rations inadequate in roughage. The disease does occur on old pastures when, as previously stated, it is commonly associated with periods of mild weather in spring and autumn. The statement that this disease is more common on new leys than old pastures is of some interest, although precise data do not exist to confirm or disprove such a suggestion, and because there has been a great increase in temporary pastures during recent years a relatively greater incidence on this type of pasture is to be expected. In an attempt to account for this alleged difference it has been suggested that the young pastures, containing a relatively small number of species of grasses and clovers and small numbers of unsown species of plants, are in some unspecified way insufficient for the needs of the grazing animal. Until it is proved that the incidence of enterotoxaemia is greater on temporary than permanent pastures any discussion on this aspect of the problem may appear to be hypothetical, but as it is unlikely that we shall ever obtain precise figures it is of interest to speculate on the reasons for the complete absence of this condition amongst ewes on the mountain. As previously stated, temporary pastures have a smaller variety of species than permanent pastures and yet are alleged to be more often associated with enterotoxaemia; on the other hand, mountain pastures carry a smaller number of species than lowland leys and yet the disease is not seen on the mountain. This means that mere variety in the diet of the animal is not sufficient to account for this difference in incidence. It is generally agreed that enterotoxaemia is preceded by some degree of atony of the bowel wall. If this be true, is it possible that the differences in disease incidence between temporary lowland pastures and mountain pastures are due to deficiency in the lowland pasture, or, alternatively, to the presence to a greater extent in hill pasture of certain stimulating substances in the herbage which help in some way to maintain the bowel tone?

It is of considerable interest and importance that losses from disease are smaller in hill than lowland flocks and that hill flocks suffer extensively from disease only when away from their natural environment. Under all systems of flock management the object of the flockmaster is to maintain a state of equilibrium between the flock and its environment, so that the sheep are maintained in health while producing the maximum quantity of mutton and/or wool for sale. This remains the object, whether the sheep are located upon a hill or a lowland pasture or folded upon an arable crop. If, as would appear, the health of hill sheep is better than that of lowland sheep, then the hill sheep farmer is more successful in maintaining this state of equilibrium than is his lowland counterpart. Is this because he is able or compelled to maintain his flock as a relatively stable unit? I think this is so, and as a result of this need for the maintenance of a relatively stable unit, the practice of paying extra for an acclimatised hill flock is widespread in hill areas. Acclimatisation certainly means something and a flockmaster is very reluctant to change his breed or type as so many attempts made in the past by his predecessors have proved costly failures. Little can be done to improve hill pastures permanently and much of the improvement carried out is quickly reversed and the pastures revert to their original type or become infested with rushes. Because of this difficulty of permanently altering the environment a type of animal is evolved under the stable conditions of hill farming in harmony with its environment. On lowland farms where different conditions exist it is possible to change the environment to a considerable extent; the plough may be used widely and old permanent pastures converted into new leys at relatively low cost. In the same way the limits within which the breed of sheep kept can be changed are also wider than in hill flocks. I often wonder whether during recent years these safe limits have been exceeded. Under conditions of high fertility the limits are very wide and it is only under gross mismanagement that nutritional diseases appear, but where the fertility of the soil is marginal—the limits of its fertility conditioned perhaps by the level of trace elements—metabolic disorders such as pining may appear in certain seasons. Again on marginal farms of relatively low fertility the use of lime and basic slag under conditions of ley farming may lead to an increased growth and increased stocking, but the herbage may not be suitable to carry the increased numbers of sheep of a heavier type than that kept on the farm before "improvement" took place. In areas of this type a common practice is to sell the lambs off the ewes when still suckling as it is only after weaning

that many of these so-called pining conditions appear. Now in an endeavour to get bigger weights the lambs are kept on, but often the desired object is not attained and the lambs go back in condition and losses may occur.

As the sheep is the only farm animal which is now kept under natural or semi-natural conditions and as many of the important diseases of this animal cannot be reproduced, a study of the environment and the ecological conditions under which they occur is most essential. Such a study and the investigations being conducted at Aberystwyth and at other centres on the biochemistry of pasture herbage plants may throw some light on the predisposing factors which are without doubt of major importance.

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"BREID" AND THE COMPLEXITY OF ITS NATURE

BY

W. T. ROWLANDS

The term "breid" finds frequent expression both in the spoken and written word on the subject of diseases of hill sheep in Wales, and in origin dates back at least to the seventeenth century. It is used to describe a state of ill-health in sheep exhibiting symptoms suggestive of some pathological change in the Central Nervous System. Nevertheless, it is used without any regard for the possible aetiology of the condition, the symptoms exhibited being the one and only arbiter. Since the Congress is being held this year in the Principality, it is thought not inappropriate in a symposium on Sheep Diseases to bring to your notice the results of research into this condition. Investigations have been spread over a number of years and only now has its true nature been elucidated.

Incidence.—This varies considerably from sheep-walk to sheep-walk, the range being of the order of 0·5 per cent. to 20 per cent. It is claimed to affect both young and adult sheep irrespective of sex, but to be most common in sheep under 18 months of age.

Symptoms.—Whilst these also vary, they are nevertheless consistent in that they all tend to indicate an apparent involvement of the C.N.S. They range from complete stupor, blindness and varying degrees of motor paralysis to permanent deformities—torticollis, permanent extension of one or more limbs, etc. Often there is a hyperexcitability with a disturbance in gait, the head may be held high or it may be pushed into a wall or gate. Again a limb may be dragged, or the sheep may collapse when forced to move or turn suddenly. The head may be forced back, the eyes roll, the animal falling over and paddling wildly with its feet. All these symptoms may be noted in different sheep in the same flock at one and the same time or in sheep in different flocks at various times.

Aetiology.—The investigation of the aetiology of breid was approached from the outset, having in mind that it might well prove to be a complex of several, possibly widely differing, factors owing to the widely varying circumstances in which it occurs. The investigation has proved that it is indeed such a complex, consisting of several aetiological factors which give rise to rather similar clinical symptoms which alone, and without recourse to further study, serve to form the impression of a single disease entity.

Early in the investigations it became obvious that it was reasonable to associate many cases of breid with the presence of the ordinary sheep tick (*Ixodes ricinus*), despite the fact that tick populations varied considerably from sheep walk to sheep walk without the occurrence or incidence of breid necessarily following the same pattern. One came across breid where there were no ticks and ticks where no breid occurred in the sheep. Many cases of so-called breid in lambs were found on *post-mortem* examination to be merely *atypical* manifestations of tick pyaemia. Tick pyaemia itself is a well-recognised disease entity, known to the farmer as a form of joint ill. This, as is well known, is due to an infection through tick bites with a pathogenic staphylococcus, with localisation of infection in one or other of the limb joints with resulting pain and swelling, pus formation, and associated lameness of varying degree. In the cases diagnosed clinically by shepherds as breid, on the other hand, the localisation of infection, which in any case is purely fortuitous, was found to have involved various sites in the C.N.S., more commonly the lumbar region of the spinal cord. In a few instances abscesses were found to involve the brain. Such cases were associated with a history of sudden death or a very short ill-defined illness.

However, the aetiology of breid could not be explained on this basis alone. Its possible association with ticks, now proved to this extent, was recently carried a stage further. For many years one had a strong suspicion that breid might be a manifestation of louping ill and repeated attempts to prove this served only to strengthen the suspicion without offering any concrete evidence wherewith to confirm this. The work, nevertheless, had shown that tick-borne fever was quite a common disease among sheep in certain sheep walks. Four years ago the investigation of cases of breid in an area in Merionethshire presented our first evidence which was sufficiently strong to warrant a diagnosis of louping ill, for it was possible to show (*a*) the presence of specific louping ill virus-neutralising antibody in the sera of recovered sheep, (*b*) an excellent specific protection afforded by louping ill vaccine, reducing an annual mortality from 20 per cent. to less than 1 per cent., (*c*) a histological picture in brain and cord of affected lambs indistinguishable from that seen in known cases of naturally occurring louping ill. This was accepted as evidence pointing to the fact that breid in this instance was a manifestation of louping ill. This, incidentally, was the first time the presence of the disease was confirmed in Wales.

Some of the symptoms associated with breid were also considered as strongly suggestive of swayback, although at that time the association of copper with this pathological condition was not fully appreciated. Indeed, in certain cases of breid, swayback was, in fact, confirmed as being the condition present and responsible for the symptoms. In the first instance diagnosis was made on purely histological grounds.

Speaking generally, it may be said of the soils of the hill country of Wales that they are grossly deficient in lime. Exceptions to this rule were obvious, however, and the value of the application of lime in the improvement of hill pasture and particularly the "ffridd" or "in-bye" land was appreciated and practised by a few enlightened farmers. Quite often, and particularly within recent years, with the emphasis on the "liming" campaign, the enthusiasm to lime outstripped the need in many cases and over-liming resulted so that the trace elements became "bound" and inaccessible to grazing sheep. It has been on land of this nature that cases of breid, diagnosed as swayback,

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have often been encountered and the disease been confirmed by detailed histological examination of affected nervous tissue and the detection of a low blood-copper status of mothers following a biochemical examination.

In spite of this, however, a residue of odd cases of sway-back-like conditions occurring in certain flocks and still referred to as " breid " remained to cause much speculation, for despite careful histological and biochemical examination, it was never possible to produce convincing evidence to support a valid diagnosis of swayback. The position remained thus until an opportunity was presented a few years ago to investigate losses of this nature in considerable detail, in the flock of the University College at Bangor. The results of this work having been published elsewhere,[1, 5] suffice it here to say that it was shown to be an inherited form of cortical cerebellar atrophy distinct in every respect from the demyelination of the ascending motor tracts typical of swayback. There is no doubt, as shown by further investigation among hill flocks, that by the use of certain " carrier " rams mated to related females, odd cases of this condition occur which by a mere superficial study of symptoms, without much careful histological investigation, might be regarded casually as swayback and again, in turn, as breid.

It was not unnatural to regard certain cases of breid in the first instance as manifestations of " gid," a condition well known to and easily recognised by experienced shepherds. This condition has shown an appreciable increase in recent years on our hill sheep walks and there are good grounds for associating this, in turn, with an increase in the fox population. It is recognised that the fox, like the dog, can act as the primary host of the tapeworm (*T. multiceps*) and so be directly instrumental in infecting sheep. It would otherwise be difficult to explain the observed increase in the incidence of gid had reliance to be placed merely on the presence of the dog as primary host. The theory that gid might explain certain cases of breid did not receive ready acceptance by shepherds, but several cases of reported breid were found on *post-mortem* examination to substantiate this view. In fairness to the shepherd, however, it must be stated that the location of the coenural cyst was always " abnormal " in that one, or more (often two or three), cysts were found at the base of the brain, or in the cervical and even lumbar region of the cord. Hence there was an absence of those symptoms more commonly associated in the mind of the shepherd with gid or sturdy.

Discussion and Conclusion

The result of this work, indicating as it does the complexity of the nature of the condition " breid," is reminiscent of the earlier findings of M'Fadyean[2] in Northumberland, Pool, Brownlee and Wilson[3] in Scotland and Lyle Stewart[4] again in Northumberland when investigating losses in hill sheep, all of which were regarded locally as being due to louping ill. M'Fadyean's classification of these losses into three main groups, which would in present-day nomenclature be roughly represented by (*a*) tick pyaemia, (*b*) enterotoxaemia or pulpy kidney disease, (*c*) louping ill, swayback or coenurosis, serves only to emphasise the similarity between the three hill sheep districts, both in the types of specific disease and the way in which they are regarded by the shepherd as being manifestations of a single disease. It emphasises also the need for accurate diagnosis before adequate curative or preventive measures against losses can be put into effect and the need also for laboratory facilities to establish such a diagnosis. The elucidation of the various disease conditions collectively known as breid and the cause of the majority of the more serious specific diseases of hill sheep makes the future approach to the problem of disease in sheep one of a more fundamental character, involved in the investigation of those factors of nutrition and breeding which play an all-important part in the promotion and maintenance of animal health generally. Meanwhile, it is confidently maintained that provided a satisfactory diagnosis is made, the prevention or cure of the vast majority of specific diseases affecting hill sheep in Wales can be effected by the adoption, where necessary, of known and tried prophylactics and therapeutic agents.

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ABORTION OF SHEEP

BY

J. T. STAMP

In Britain, although abortion in the ewe is not one of the most serious diseases in an overall picture of sheep diseases, it is well known that it may cause considerable economic loss and this is especially so in certain districts of which the Border area of England and Scotland is one. Abortion in sheep has been widely described throughout the world, the causal factor being frequently bacterial. *Vibrio foetus, Salmonella abortus ovis, Brucella abortus, Brucella melitensis* and *Bacterium coli* are but a few of the organisms which have been incriminated, but in this country it appeared that *Vibrio foetus* (M'Fadyean & Stockman, 1913) and *Salmonella abortus ovis* (Bosworth & Glover, 1925) were the only organisms causing abortion, while in many cases no organism was isolated at all. It is the purpose of this section of the present symposium to define again the problem of ewe abortion in Britain in the light of existing knowledge.

Abortion due to Vibrio foetus

This organism is fairly widely distributed among sheep in England, but it has never been isolated in Scotland. The majority of outbreaks of abortion due to this organism are sporadic and it is likely that outbreaks in clean flocks are due to carrier animals. This type of abortion is rarely experienced in the same flock in successive seasons, which suggests that a lasting immunity is developed.

The abortions may commence at a fairly early stage in the gestation period and continue over a considerable time. The lambs are generally fresh when aborted, although M'Fadyean and Stockman in their original investigation found that the foetuses were decomposed when aborted.

Examination of the aborted lamb shows subcutaneous oedema and a considerable excess of blood-stained serous or sero-fibrinous fluid in the body cavities. The liver may be considerably enlarged and show a number of pale necrotic areas.

The most reliable method of diagnosis is to demonstrate the causal organism either in the stomach of the foetus or in its membranes. This can be done either by staining a smear with dilute carbol-fuchsin or by cultural methods. If such material is not available the agglutination test might

be useful if blood samples were taken from a number of animals in an affected flock.

Abortion due to *Salmonella abortus ovis*

This organism appears to have a very limited distribution, being confined almost entirely to the South-East of England. At one time it was an important source of loss in this area (Bosworth, 1936), but during recent years it has not been of great importance. Carrier sheep are probably the chief means of spread.

The flock appears perfectly healthy until about six weeks before lambing is due to begin when abortions commence suddenly and in considerable numbers. The aborted lambs are always very fresh.

Diagnosis depends mainly upon the isolation of the organism from the foetus. The agglutination test can be used, but the results frequently are difficult to interpret.

Enzootic Abortion

Greig (1936) described an enzootic abortion of sheep in many counties of Scotland and suggested that the cause was a dietary deficiency. Recently, however, Stamp, McEwen, Watt and Nisbet (1950), investigating the same disease on the arable farms of the Scottish Border Counties, have shown that the cause of enzootic abortion on these farms is a micro-organism.

The disease has occurred annually on certain farms for long periods of time. In flocks where the disease has been present for several years the incidence of abortion is about 5 per cent., but on newly-infected farms the incidence may be very much higher for several years, up to 25 to 30 per cent. There is very good evidence that farms completely free from abortion will suddenly become affected while other farms which have been troubled for many years have a gradually dwindling incidence rate.

There is considerable variation in the age of sheep aborting. On some farms the gimmers are chiefly affected, but the second-crop ewe is probably the one most affected, although older ewes are by no means free of the disease. Contrary to the findings of Greig (1936), it has been found that aborted sheep rarely abort a second time.

Abortion, and premature lambing, generally take place late in pregnancy, most frequently during the last two or three weeks before lambing. Frequently the lamb or lambs are quite normal, except that they are premature, and even may be living, but quickly die after being born. Sometimes in twin pregnancies one lamb is born apparently normal, although premature, while the other is rotten and has obviously been dead *in utero* for some considerable time. Retention of the placenta and subsequent death of the ewe is not uncommon. On affected farms the lambs which are carried full term often are weakly at birth and do not thrive properly and this may be the chief clinical feature.

The causal agent of this type of abortion belongs to either the rickettsia or psittacosis-lymphogranuloma group of organisms. Diagnosis depends upon the demonstration of the elementary bodies in smears made from diseased foetal placentas, stained by dilute Ziehl-Neelsen carbol fuchsin (1 to 10), differentiated with dilute acetic acid, and lightly counterstained with dilute methylene blue. They also stain by Giemsa, Macchiavello and Castaneda stains. At the moment there is no other means of diagnosis.

The manner of transmission of the disease is not known and all that can be stated is that ticks are not implicated.

It has long been known that the condition is widespread in the Border counties of Scotland, but information regarding the extent and distribution of the disease in other areas is not at present available, although it is already known that several outbreaks have been reported from England.

Tick-Borne Fever as a Cause of Abortion

Lyle Stewart (1936) suggested that tick-borne fever might be a cause of abortion in sheep and Harbour (1945) also considered that this was the case. The evidence that tick-borne fever is the cause of such abortions was purely circumstantial, however, in that it was not known whether tick-borne fever could in fact produce abortion. This has recently been demonstrated experimentally, however, (Stamp and Watt, 1950; Jamieson, 1950). In one experiment ten susceptible and ten immune sheep were inoculated with tick-borne fever blood. All sheep in the susceptible group showed tick-borne fever bodies in their blood and all but one showed typical temperature reactions, while five of them aborted 7 to 10 days after inoculation. Examination of the aborted lambs was negative for the known bacterial causes of abortion. In the immune group, apart from one which died of blackquarter following inoculation, there was no temperature reaction, no tick-borne fever bodies and no abortion. This is good evidence that tick-borne fever occurring in the pregnant sheep can produce a considerable degree of abortion.

Abortion, however, is not a feature of heavily tick-infested farms; it occurs only in sheep which, for one reason or another, would appear to be non-acclimatised. For example, Harbour (1945) considered that the high abortion rate (30 per cent) observed on a tick-infested farm was due to the incoming of non-acclimatised sheep from a tick-free farm. Harbour also considers that hill hoggs wintered away on tick-free ground may entirely miss the spring cycle of tick activity and meet with tick-borne fever infection again only as pregnant gimmers, when abortion may occur. It was suggested that tick-borne fever is the causal factor. Abortion also occurs on farms where the tick infestation is comparatively light, and it is again suggested that tick-borne fever is the cause. It is assumed in all these cases that the aborting sheep have either lost their " immunity " to tick-borne fever or have never obtained any " immunity." It also follows that sheep on tick infested farms where there is only a spring tick cycle are assumed to retain their " immunity " from year to year. Stamp and Watt have given some experimental evidence to support these assumptions so far as the Border area of Scotland is concerned. They have shown that one inoculation of 10 c.c. of virulent T.B.F. blood is sufficient to give a considerable degree of " immunity." in both three-month-old lambs and ewes to a similar challenge dose for a period of 12 months. A similar lasting " immunity " in gimmers to such a challenge dose was demonstrated in sheep grazing a heavily tick-infested Border farm. On the other hand, on another farm where tick infestation was only slight and abortion occurred the immunity of hoggs, glimmers and second crop ewes to tick-borne fever was by no means overall.

Summary

It can be seen that there are at least four types of abortion in sheep due to specific infections. It is also recognised that there are numerous causes of abortion other than micro-organisms, such as faulty management and feeding, but it must be admitted that even after elimination of all the factors mentioned there is good evidence that the whole story is not yet told.

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Discussion

Mr. D. E. Davies, M.R.C.V.S. (Llanybyther): In accepting the invitation to open the discussion, in conjunction with Mr. D. R. Allen, on the papers to be presented under the title "Symposium on Diseases of Sheep," I was very conscious of the honour involved, and for which I now wish to express my sincere thanks, but at the same time I feared I would be at a loss to do justice to a subject on which I do not pretend to possess any special knowledge. My interest, however, in sheep and the diseases from which they suffer, coupled with a sense of duty on the occasion of the holding of the Annual Congress in the South Wales Division area, prevailed. I, therefore, very humbly proceed to present a few brief remarks, trusting we shall have the quality of discussion which the four contributors to the papers so rightly deserve.

The first contribution presents two very interesting recordings of streptococcal infections other than the now well-known streptococcal joint-ill of lambs. It is significant to note, by contrast, that in the condition of endocarditis described there are no joint lesions associated with it. It is also stated that according to the available evidence, infection seems to occur in lambing pens used on successive seasons. Does Dr. Jamieson suggest here that it may require the use of an infected lambing pen over a number of years before clinical symptoms of the disease can appear? I would also like to know, if possible, whether the incidence of the disease was greater, as I would expect, towards the end of the lambing season than it was in earlier stages. In the unfortunate absence of any rational treatment at the present time, what preventative measures, in so far as they can be given, should be advocated? I would also be pleased to know whether there is any available evidence as to how a pen first becomes infected. Similarly, in the outbreaks of pneumonia from which the same organism was isolated, one would welcome further information on such questions as the time of the year the outbreaks were encountered, the class of sheep involved, and if there is any connection between the two conditions, since the cause seems to be a common factor. By that I mean, was there any evidence linking the condition in lambs with a possible previous outbreak of pneumonia in the mothers prior to the lambing season?

Continuing into the realm of anaerobic conditions, it is again interesting to note the recording of the widespread dissemination of latent spores of *Cl. oedematiens* in healthy tissues, and that this state of affairs is an important predisposing factor, particularly in black disease areas. I regret to say that I have had no experience of *Cl. oedematiens* blackquarter in sheep confirmed by laboratory diagnosis, but quite recently I encountered an outbreak of blackquarter with identical lesions in young ewe lambs after docking, deaths occurring in 36 to 48 hours after the operation, which had been done by the Burdizzo—an operation quite unfamiliar to me at the time. No trouble occurred amongst the castrated lambs. I would be interested to know whether Dr. Jamieson has met with a similar experience. One can also recall outbreaks of blackquarter in ewes after shearing and dipping and individual sudden deaths after penning for other purposes which presented a similar *post-mortem* lesion. In the light of the recent discoveries I am prepared to accept these as being due to *Cl. oedematiens*. I have never recognised the condition bighead in rams, and although it is said to develop rapidly, I am wondering whether on occasions on the Welsh hills it would have time to develop at all. Is the condition seen as frequently in horned rams as in the hornless?

Under the heading enterotoxaemias it may be that the writer is striking a timely note in his condemnation of both practitioner and laboratory worker. I will frankly admit that when faced with this type of problem I often find myself suffering from a complex too "cloudy" even to pin faith in anything "pulpy." Consequently, I have preferred to rely on laboratory reports. Yet I have seen shepherds come down from the hills reporting good results from lamb dysentery serum when a laboratory report had been negative.

The mutual realisation of the difficulties appertaining to this group of diseases must in the end lead to better understanding. The illustration that follows on the paper shows only too clearly what one is liable to be up against, and it is our duty, therefore, not only to put more individual earnestness of purpose into our labours, but also to labour closer together.

My friend Mr. Hughes has presented a very difficult and controversial subject. He has produced figures in support of an argument that, relatively, there are more losses from disease among lowland flocks than in hill flocks in Wales. My personal experience has made me rather too sceptical to accept readily any figures on this subject, particularly from hill flock-masters, as reliable. I can well recall making some such attempts at obtaining figures, but I discovered horrible snags. Such things as agricultural returns, hill-sheep subsidy claim form returns, dipping returns, etc., all played a very amusing and complicated part between the true state of affairs and what they would conjure could bring them the maximum of subsidy and the minimum of income tax to pay. Nevertheless, there are a number of very interesting points brought forward, all of which are sufficiently extensive and debatable to form separate subjects of discussion at some future date, when, I hope, our knowledge will have made some considerable advancement. I would readily agree that it is yet necessary to pin down one or more predisposing factors in the aetiology of enterotoxaemia, and before a reasonable conclusion can be drawn on the influence of a type and quality of pasture on the incidence of enterotoxaemia quite a number of other problems would require clearing up. However, I gladly pass on with a brief reference to his discussion of the merits of maintaining an equilibrium between a flock and its environment. Mr. Hughes mentions the practice of paying extra for an acclimatised hill flock, presumably when a fresh tenant takes over a holding. If so, I fail to grasp the strength of the argument. Where does disease enter the picture here? This practice is not only customary but imperative, solely because of the acquired instinct, if I may say so, of the hill ewe to habitate a limited unfenced range, thereby avoiding much of the extra shepherding which would otherwise be required.

Breid.—Much as I welcome this contribution by Mr. Rowlands on the aetiology of the various manifestations of breid, there still remains the difficulty appertaining to the loose use of this unfortunate word from one locality to another. The word "breid," as I know it, is used in some localities to denote a disease condition exhibiting symptoms of any nervous disorder, irrespective of its true aetiology. In others it has been used in a more selective sense to denote one specific type of condition; for example, swayback in its true form is sometimes known to the shepherd as "breid"; so also are true and typical "gid" and even joint-ill known as "breid" in different localities. It seems to me, therefore, that the task of explaining the correct story in its proper perspective remains as difficult as was previously that of trying to explain the probable cause of what was then an unknown quantity. The one shepherd has to be told to rid his lambs of ticks, the other to destroy the foxes in the forestries, others to use copper and less lime, while still others must be told to get rid of certain rams from their flocks. In spite of all this, we are very thankful for the true aetiology of "breid." I would, however, like to ask Mr. Rowlands whether he is able to pass on any hints on differential diagnosis on clinical symptoms only; for example, a true case of copper deficiency swayback, and of joint-ill lesions in the spinal cord.

The section on abortion in sheep defines the position as it is at present known.

Referring to the disease arising from *Vibrio foetus* infection,

Mr. Stamp mentions the following points:—

1. Fresh outbreaks in clean flocks may be due to carrier animals.

2. The non-appearance of the disease in flocks on successive seasons suggests an acquired lasting immunity.

3. In the absence of suitable material for the demonstration of the causal organism the agglutination test may be useful if blood samples are taken from a number of animals in an affected flock.

Taken together, they prompt me to enquire what would be the value of the agglutination test in a problem which once presented much difficulty to me. When carrying out survey work on the Welsh hills, I frequently ran up against a difficulty when discussing the incidence and cause of barren ewes with flock-masters and shepherds, and in whose flocks the percentage of these appeared to be rather high. The difficulty arose out of the inability of the owner to tell me whether the ewes had been in lamb, had aborted, or had lambed normally and had lost their lambs early in life; all of this because in very many cases the owner himself would discover that the ewe was without a lamb only at shearing or other specific gathering. I would be pleased if Mr. Stamp would give his opinion on the value of an agglutination test under such circumstances.

His reference to enzootic abortion, its causal agent and distribution prompts a stimulation to make further enquiries into what may well prove to be a similar type infection, particularly in yearlings in several lowland and enclosed marginal flocks in West Wales.

In conclusion, I would like to express my personal thanks to the separate contributors to the symposium for a wealth of welcome information.

The Chairman: I said last night that Cardiff had "done us proud"; it has, even to the extent of finding an opener for this discussion. Mr. Allen.

Mr. D. R. Allen, M.R.C.V.S. (Cardiff): I should first like to thank the authors for providing such an interesting paper, one which, I feel sure, will evoke a most instructive general discussion.

The conditions due to *Str. faecalis*, described by Dr. Jamieson, provide further evidence of the importance of this organism, which is so frequently encountered that it is apt to receive less attention than it deserves. It is worthy of note that it is occasionally the causal organism in bovine mastitis, is usually present in pyelonephritis in cattle—although possibly of little importance in this condition unless acting in symbiosis with *Corynebacterium renale*—is often isolated from various organs of pigs, although of doubtful significance, and in man is associated with some cases of bacterial endocarditis and urinary infections. In view of such evidence of its invasive and pathogenic properties its presence in diseased conditions cannot be ignored, especially as therapeutic treatment is at present so unsatisfactory.

I should like to know whether Dr. Jamieson has encountered black disease in cattle on any of the black disease properties in Scotland, and if so, whether the lesions were identical with those in sheep. Also, whether any cases in sheep have been associated with organisms other than *Cl. oedematiens*. Recently, I examined a piece of liver from a ewe which had died suddenly and found a lesion which had the microscopic appearance of black disease. *Cl. septique* was the only anerobe isolated, but this may not have been the causal organism.

Dr. Jamieson has stated that in black disease areas the incidence of *Cl. oedematiens* spores is greater than in areas where the disease has not been recognised. Does he find a corresponding increase in the incidence of blackquarter due to *Cl. oedematiens* in these areas other than the particular type which he describes?

Blackquarter in this part of the country is usually associated with *Cl. chauvoei* on farms where no prophylactic measures are adopted. On farms where *Cl. chauvoei* vaccine is used, *Cl. septique* or *Cl. oedematiens* is frequently the cause. The inclusion of *Cl. oedematiens* antigen in blackquarter prophylactics would probably be of great value.

In the cases described in which ewe lambs developed blackquarter, was there anything to account for the activation of latent spores in those animals? Was the incidence of the disease in the ewe lambs the same as in the ram lambs which were castrated?

The manifestations of *Cl. oedematiens* present an interesting variety of syndromes and the exciting factor or factors present a problem requiring investigation. In all these manifestations, except the cases of blackquarter in the ewe lambs, it appears that tissue damage is the exciting factor. Does a localised blood stasis following injury permit the organisms to become active or is it histamine, produced by such tissue damage, which is the factor which activates the latent spores?

I am glad that Dr. Jamieson and Mr. Hughes have stressed the difficulty in diagnosing enterotoxaemia, as there is little doubt that the laboratory methods give results which frequently are inconclusive and confusing and in some cases could be misleading. I should like to illustrate this with a case which I investigated three years ago. Losses on a certain farm were heavy and we were called in to examine 14 dead ewes. All were *post-mortemed* and the findings were typical of Type D enterotoxaemia. Bowel filtrates were examined from ten animals; of these, five showed the presence of Type D *Cl. welchii* toxin, the other five failed to show the presence of any toxin. Had five or fewer filtrates been examined, there is the possibility that negative ones could have been selected, in which case the laboratory findings would have pointed strongly against this condition being the cause of the deaths.

I feel, therefore, that histories in cases of suspected enterotoxaemia are of great importance, especially as they so frequently reveal the same sequence of events, *viz.*, no losses previous to recent removal of the flock on to better pastures, root crops, etc. Since then the animals affected have been the ones in best condition.

The association of enterotoxaemia with different types of grazing as set out by Mr. Hughes gives an accurate representation of the distribution of cases in Wales. Whether the condition is associated with the presence or absence of any particular substances in the food or products of metabolism, or is due merely to the inability of the animals to withstand sudden improvements in diet, is not clear. Nevertheless, I think that the American term "overeating disease" is very appropriate and signifies something to the farmer which in many cases the term enterotoxaemia fails to do.

The fact that enterotoxaemia does not occur in hill sheep when on the hills may be due to the fact that there they are never subjected to sudden improvement in diet and it is only when they are brought from the hills that the trouble appears. In the case of lowland sheep these are periodically subjected to changes of diet and trouble arises when the changes involve an improvement. This condition is one of the most important affecting sheep in South Wales, but I have never encountered a case associated with starvation or movement to a poor pasture—a fact which I think contraindicates a herbage deficiency as a factor in the aetiology.

Although this disease has not been reproduced, American workers in Colorado have increased its incidence by feeding virulent cultures of *Cl. welchii* to experimental flocks. These workers have also shown that the addition of adequate amounts of sulphur to the diet produces a marked decrease in the incidence of the condition. This addition also decreases appetite and growth slightly. This reduction of incidence may be associated with the check in growth, the increased bowel movements or some chemical reaction produced by the sulphur.

In so far as the predisposing factor appears to be *Cl. welchii* and the exciting factor nutritional, or *vice versa*, there is no doubt that much can be done to prevent the condition by tackling either of these factors. Vaccination with *Ovitoxicus* anaculture has given excellent results without any changes in husbandry in this part of the country. In one part of Carmarthenshire, where annual losses in hill sheep brought on to pastures for lambing varied from about 15 per cent. to 40 per cent., vaccination has reduced the losses to negligible proportions; in fact, this year one farm suffered no losses.

When working with sheep it becomes evident that hill flocks suffer fewer losses and are subjected to fewer diseases than lowland flocks. The statistics of such losses given by Mr. Hughes are extremely interesting and typical of many parts of the country,

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even though the incidence of different diseases contributing to these figures is variable.

When one considers a sheep's greatest enemy to be another sheep—and there is always a greater tendency to overstocking in lowland flocks than on the hills—it seems more than probable that this factor is in some part responsible for the heavier losses in lowland flocks.

Mr. Rowlands, in his paper on breid, has shown that whereas stockowners may diagnose or name—often to their own satisfaction—certain diseases, it is only when these conditions are investigated systematically that their true nature becomes apparent, and not until then can prevention or treatment be attempted with much hope of success.

So far as I know, the term "breid" is not used in South Wales, but, nevertheless, some of the conditions to which it would be applied do occur. Up to the present neither louping-ill nor cortical cerebellar atrophy have been diagnosed, although there is reason to suspect that the latter may have appeared but been regarded by the farmers as swayback.

Just as breid may be applied to diseases showing nervous symptoms, the name "murren" is used to denote many sudden deaths in sheep or cattle. This term is mainly applied to blackquarter, but one finds that it is also erroneously used for enterotoxaemia, pulpy kidney disease and braxy. Black disease has been diagnosed on a few occasions in South Wales, and it is reasonable to assume that there may have been other cases which have been classified by farmers as murren: consequently their exact identity has never been established. The use of such terms is very unfortunate, as they may satisfy the farmer but at the same time conceal the identity of such a variety of conditions.

With regard to cortical cerebellar atrophy, can Mr. Rowlands inform us whether lambs are invariably affected when born or, if not, up to what age may symptoms develop? In view of its presumed hereditary nature, have any other hereditary abnormalities, *e.g.*, type of wool, or pigmentation, been observed?

I should like to ask Mr. Rowlands whether to the best of his knowledge the complexity of breid has now been solved or whether other conditions so classified are still under investigation.

The account of the specific types of abortion given by Mr. Stamp, and also his recent articles, will be welcomed by all for their comprehensive nature and, I have no doubt, will be referred to frequently when advice is sought regarding outbreaks of abortion in sheep.

It is difficult to assess the significance of abortion in sheep until it appears in epidemic form. Most farmers will admit an occasional abortion, but such losses are often attributed to dogs, etc., and nothing further is done about them. As a result of this, certain specific types of abortion may occur without the owners becoming unduly alarmed. The geographical distribution of abortion indicates that in Scotland and the North of England the disease is endemic and chiefly due to two specific causes, those being tick-borne fever and enzootic abortion, whereas in other parts of the country the disease appears to be largely sporadic and due to the other specific infections.

As a result of sales and the consequent widespread movement of sheep, the types of abortion prevalent in Scotland appear likely to gain wider distribution unless careful attention is paid to the factors already known concerning these conditions. In the case of tick-borne fever the control of ticks will play an important part, and, difficult though this task may be, there is no doubt that much can be done, thereby not only contributing to the control of tick-borne fever and its consequences, but also to the control of louping-ill, tick pyaemia and piroplasmosis.

The CHAIRMAN: The standard has been very nicely set, and the subject is now open for general discussion.

General Discussion

Dr. A. J. WILSDON (Hereford): Two of the speakers this morning have caused some doubt on the enterotoxaemia theory without putting anything constructive in place of it. I was at Cambridge in 1929 shortly after Dalling had described the lamb dysentery bacillus. We were working on the cause of lamb dysentery at that time and Cambridge were unable to accept Dalling's findings because of their inability to produce lamb dysentery where lambs were dosed with large quantities of virulent cultures of lamb dysentery bacilli. There were some 50 lambs dosed in all and they all gave negative results. There was one case of lamb dysentery which occurred in the laboratory at the time, but that was in an animal which was not under experiment. There is perhaps something to be learnt from this result appplicable to all bacteria. What are the factors which bacteria require to become virulent and produce death under natural conditions which are apparently absent in experimental work?

I am of the opinion that the enterotoxaemia work is correct. Anyone who has worked with *Clostridium welchii* Type D will appreciate that many of the strains are poor toxin producers under artificial conditions. To demonstrate Type D toxin it is necessary to filter large quantities of intestinal contents, and as many of the sheep which are sent to the laboratories for *post-mortem* examination are in a putrefactive state, there is no doubt that many of the toxins are lost or destroyed in the process. Most of the laboratories are considerable distances from the farms and this difficulty is not easily overcome without better facilities.

Mr. Hughes has stated that he has isolated Type C. When I classified *Clostridium welchii* I had only one strain of Type C and that was provided by Dr. McEwen, although I had strains of *Clostridium welchii* from many sources and from all types of animals. I should be glad if Mr. Hughes would confirm that he isolated *Clostridium welchii* Type C.

Dr. Jamieson has suggested that *Clostridium chauvoei* is not a problem to be considered in this country. In my investigation of sheep diseases in the Black Mountains I have found that the anaerobe responsible for the highest mortality amongst sheep in that area was *Clostridium chauvoei*.

I am glad to note that in this discussion there has been no reference to infertility amongst sheep in the rich pastures where the calcium-phosphorus ratio has been upset. It is difficult for me to understand why cattle should be affected in this way and not sheep.

I hope that at some future congress we will invite some of the Australian and New Zealand workers to give a paper or papers on sheep diseases.

Mr. G. C. BRANDER (Berkhamsted): I have found the papers very stimulating and I think they all illustrated the fact that the problem of disease control is much more complicated than was thought originally. Not many years ago it was a case in disease of find the bacteria, make a vaccine, and then the disease was considered to be under control.

We have had a discussion on acetonaemia and, at the end, one came to the conclusion that there is still very much to be learnt. The investigation of sterility is in much the same position. In sheep diseases there are still many factors to be investigated. In addition to the investigation of specific bacteria, the position of vitamins, minerals, etc., in relation to health has still to be fully explored.

In enterotoxaemia it is possible to encounter the condition where a toxin is present but no lesions, and on other occasions when lesions are present but no toxin. I consider that it is becoming more and more necessary for veterinary practitioners to know about sheep diseases and to be interested in sheep. There are many sheep farmers who do not consider consulting their veterinary surgeon for the diagnosis of sheep diseases, a state of affairs which is bad for both sides.

More facilities for the investigation of sheep diseases should be provided and, where these are provided, the investigation officer should always work in association with a biochemist and parasitologist.

Mr. P. S. HASTIE (Ashford): I have a certain amount of sympathy with the research workers, especially when one says the only lamb to go down with lamb dysentery was the one which had not been intentionally infected. It is difficult to get these controlled animals to "play the game."

As a practitioner I want to make this point: our whole aim in life is to satisfy our clients and to do that we have to treat, reasonably successfully, cases put before us. I would like future papers presented to the Congress to put more emphasis on treatment and/or prophylaxis rather than have a comparison or catalogue of many different diseases. (Applause.) I feel research workers have their own Association meetings where they can bring out their ideas and findings. We want something we can pass on to our clients. I hope my practice will pay my expenses to attend this Congress, and my partner will not agree to this unless I can bring something back which I can put into the practice!

To be more serious—there is one point; could the speakers throw any light on pulpy kidney disease in young sheep being of a subclinical nature? Some routine work was done in Kent on a large number of sheep. It was found that routine worming by P.T.Z. increased the live weight, but, moreover, some farms reported that

when pulpy kidney anti-serum was given as a prophylactic they got a still further increase. It was difficult to say whether the serum had any effect.

If a sheep is found dead the Kent farmer calls it "struck"; a sheep that died from any inflammatory condition was "struck," but, if a sheep died after being treated for an infection, it was not "struck," it was that "so and so assistant of yours." (Laughter.) It is difficult to convince the farmer that sheep, showing to him similar symptoms and apparently similar *post-mortem* findings, may be suffering from different diseases. This is most noticeable when "struck" and pulpy kidney disease appear in the one flock, especially if protection has already been given by one anti-serum.

With regard to abortion, I noticed that Mr. Gould on Monday mentioned the increase in *Vibrio foetus* in cattle; his reasoning was that it was becoming more like *Brucella abortus* infection in pathogenesis; spread of infection was gradual over two or more years; it was not purely venereal. In sheep you can almost say to the farmer, "Do not worry, you will probably lose a lot of lambs, but next year you will have no trouble, providing you do not import animals into that flock," whereas with Brucella abortion in cattle it can go on for several years unless vaccination is carried out. Was this difference entirely due to ovine, *en masse*, seasonal breeding?

With regard to Dr. Wilsdon's remark about the calcium-phosphorus effect on sheep infertility, I might mention that sheep are bred at the "proper" time of year; however, we still have plenty of time to find out about calcium-phosphorus in sheep fertility.

The CHAIRMAN: In defence of the Provisional Committee, it will be very delighted, Mr. Hastie, when practitioners are clamouring to write papers for the Congress. Then on the research workers' side, we are going to have a "whale of a time"!

Mr. H. M. WILSON (Cupar, Fife): I find difficulty in discussing the papers, because very much of the information given is non-controversial and factual. It is suggested that enterotoxaemia is more common on young grass. I might agree with that, but there is another factor linked here.

Cupar lies in a hollow; we have a lot of ground frost in the early morning and evening on the low-lying ground, but during the day we might get quite a lot of sunshine, and on these occasions we find instances of enterotoxaemia. It may be that during the day biochemical changes take place more rapidly in the young grass than in the old.

As far as control treatment is concerned, the results with serum and vaccine are most pleasing.

I would respectfully make the suggestion that there should be a concerted effort made by a body of research workers to investigate carefully such matters as pregnancy toxaemia. In our area the breeding stock consists largely of Leicesters and half-breds. These are both heavy breeds, and the lambing ratio in general during the last few years has risen from about a lamb and a half to two lambs per ewe. Pregnancy toxaemia in certain areas, particularly when there is a fall of snow, has become a very serious problem, the treatment of which is most unsatisfactory. We have tried every form of treatment that has been suggested, and I do think this particular problem should be investigated.

There is another condition in which I am interested, and that is "cud dropping." Unfortunately the ram breeders are concerned in this matter. All that has been done to my knowledge is that farmers have been advised that no lamb which drops the cud should be exposed for sale at the annual lamb sales. I am quite sure that in time to come it will be a serious problem. It may be there is a hereditary factor which should be dealt with in the same way as hereditary conditions are dealt with in other stock.

Mr. JOHN BARR (Penrith): It is probably impertinence on my part to come to the platform on such an intriguing subject as sheep diseases, and it is not without temerity that I do so.

The papers this morning have disappointed me somewhat in that they are particularly concerned with bacterial diseases. I am still convinced the greatest loss in the sheep industry is from parasitic gastro-enteritis. This problem does not receive the publicity it merits, for although the actual loss is in some instances connected with the death of the animal, greater loss results from delay in the animals reaching maturity. Is research work in the field of parasitic gastro-enteritis complete? Are research workers satisfied they have given us the complete answer to this disease?

Last year I thought that probably was so; this year I am not quite so happy about it. We have had numerous cases where flocks have been regularly dosed with phenothiazine as in previous years, but with not such good results.

I was interested in the point raised by Dr. Jamieson regarding the presence of latent *Cl. chauvoei* spores in muscle tissue. I recollect two instances where we were invited to investigate losses in sheep following prophylactic treatment for pulpy kidney. The shepherds had carried out the prophylactic treatment themselves as they had done previously with no untoward results; 48 hours after, the losses were considerable from a condition which we diagnosed as clinical blackquarter.

In both these instances immunisation had been carried out on wet, cold days, and I wondered if Dr. Jamieson could give any information as to whether carrying out such treatment under adverse weather conditions would activate latent spores.

Mr. W. K. CARNEGIE (Brampton, Cumberland): Mr. Barr mentioned the point I was going to raise regarding parasitic gastro-enteritis. I would go a point further. We have discarded using phenothiazine altogether. I suggest to the speakers that phenothiazine is no good for tape worm and *Nematodirus*. We have found these causing considerable mortality among the hillside sheep.

We get help from the Laboratory Service in Newcastle, but I think it is too far away; we should have one nearer in Cumberland, but we do get excellent facilities.

I would like to raise a point on pregnancy toxaemia which we noticed last year. Do the workers here think the feeding of large quantities of roots of rather a doubtful character could cause an outbreak of pregnancy toxaemia? I have noticed where these roots have been fed in large quantities we have had numerous deaths from pregnancy toxaemia; the cases in other areas did not seem to be of a similar type. We thought we could diagnose several cases, some needed calcium, some magnesium phosphorus, calcium phosphorus, and we tried out quite a few of these things.

In the pneumonias mentioned in sheep, I do not find the type of pneumonia Dr. Jamieson mentioned. I have never seen it, but we do get a type of pneumonia from sheep bought in the South of Scotland and brought over the border. After a few days they suffer from pneumonia.

Mr. F. V. JOHN (Llandilo): I should like to support Dr. Wilsdon; *Chauvoei* infection does exist in the Black Mountains and in the Vale of Towy. We have had it diagnosed several times and the use of vaccine has prevented further loss.

Type C strike also apparently exists, as the use of Type C serum has succeeded when Type D serum has failed.

With regard to pneumonia, we find a predisposing cause is either housing or transit of sheep. Some time ago, prior to the use of a popular anthelmintic, housing was recommended. This often led to severe outbreaks of pneumonia in the sheep so housed.

A very different condition we commonly come across is an incomplete opening of the os at parturition. I should like to ask if the speakers have encountered it, and what treatment they would suggest.

I should like to conclude with a plea for increased diagnostic service as had been mentioned by the speakers. We get very good service from Cardiff and Aberystwyth, but they are too far away.

Dr. C. S. M. HOPKIRK: I have come to blow the trumpet of the Australasian workers. We have done more work on sheep diseases than most other countries, and we do understand the sheep, both in health and disease, rather more than you seem to understand it here. I say that because in 1935 when we were doing work on black disease I made enquiries here, and you knew nothing about it. Later I came home in 1938 and asked everyone in this country in research stations if they knew anything about black disease, and they knew nothing. Now I find you are pretty well saturated with the disease, and seem to be getting a type we have never seen, black leg.

This is one of the most serious diseases. We have a sheep strain of *chauvoei* which does not affect cattle, but which is killing many thousands of sheep a year, and now vaccination is taking place in flocks to the extent of a quarter of a million a year. But the issue is of the cattle strain of *chauvoei*, and that protects sheep exceedingly well. I know of one farm where a number of years ago they lost in six years something like 3,000 sheep; they ran a dairy farm on the same property, the cows were running with the lambs and never became infected. Obviously the lambs were dying from *chauvoei*. By vaccinating, this farmer stopped his losses completely.

One would like to speak of many things, enterotoxaemia, gastro-enteritis, and so on. In enterotoxaemia we were early in the field in the study of that disease; Gill in 1920-29 was working on it and we had a great deal of experience of it in those early days. I think the question should be re-opened. Laboratory diagnosis is very often at fault, because you get only intestinal material, and very often the toxin is found less in the intestine than elsewhere, in the stomach and the large intestine. You do not get sufficient material in the laboratory to obtain a definite diagnosis of enterotoxaemia. I know with us if you starve the

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lambs and give them a chance to get the acid condition of the stomach improved, you do not get the same death rate as when you keep their stomachs full the whole time. The disease seems to be associated with a good type of food, and occurs most frequently when the animal is in good condition, as in most anaerobic disease.

A question was raised as to whether enterotoxaemia appeared more on leys. With us it appears on pasture. On our laboratory farm we get entertoxaemia every year and can study the disease right on our home ground, so that permanent pastures are equally conducive to toxaemia as are leys.

Mention was made of calcium deficiency and increased lime; we could not put lime on many of our areas.

I was interested last week in seeing a type of top dressing in Wales—aerial top dressing—that is going to be a solution to the control of deficiency diseases. Spray top dressing of the cobalt type—I think you will find it very useful here as we have in New Zealand.

I was wondering whether Dr. Jamieson in his statement on streptococcal infection had gone far enough in laboratory tests and that he might not find *Erysipelothrix rhusiopathiae* present.

We get a lot of abortion in ewes; it is increasing and getting very serious, but we have no ticks, and we have never been able to find the cause of abortion in our country.

There is a very big problem in the nutrition of ewes which has to be faced—gastro-enteritis again, we find, is partially nutritional, because lambs suffer from gastro-enteritis usually on the best pastures. When you find these lambs becoming infested with parasites, if you can put them on to hill country on roughage as against your lush and soft pastures, you will overcome the parasite without any treatment at all. We lose a tremendous number of lambs from gastro-enteritis, but if the farmer has roughage to give out to the lambs, he can obviate his losses, without treatment.

I would make one other point; Mr. Hastie said he thought the duty of a veterinarian was to treat the animal. I would add we should try as veterinarians to prevent disease rather than to treat it afterwards. (Applause.)

The CHAIRMAN: I should have recognised much earlier that we had Dr. Hopkirk here and seen that he got to the platform earlier, when he need not have been so hurried.

I want to make one point. There has been a good deal of discussion on the question of the diagnosis of enterotoxaemia, and even the suggestion that some of us have been over-enthusiastic in our own little field; that we have sold very nicely to you "a pup." Maybe that is true, I hardly know, but there has also been the suggestion that this difficulty of getting laboratory services out into the hills is something of real importance. I quite agree, but feel quite often these colleagues of mine who are laboratory workers must have some little tips which they can pass on to the practitioners to help them in their diagnosis work. I would like to ask, in determining enterotoxaemia is there any real value in the very simple procedure of examining smears of intestinal content? I remember Dr. McEwen drawing my attention to the fact that he could get a very good quick diagnosis, that is preliminary diagnosis, of "struck" as it occurred in the Romney Marsh, by the simple procedure of examining smears of intestinal contents, getting a picture of the mass of *Clostridium welchii*. Would my colleagues give practitioners an indication as to whether this would be helpful, and may I plead with them to put across the little tricks which sometimes we like to keep up our sleeves to pretend we are very clever people.

I believe there was an element of doubt in the Provisional Committee as to whether a symposium on sheep diseases would go down. That doubt has been completely removed. Dr. Wilsdon gave the credit to Hopkirk for the original enterotoxaemia work, but it was Gill who really set us on the road. He was trained in the London College and came to Edinburgh to finish his education. In New Zealand he undoubtedly did the piece of work which put us on the road to realising there was such a thing as enterotoxaemia.

The Replies

Dr. JAMIESON: I would add my appreciation of the response, which has been so great that it is difficult to know where to start. I will take briefly in order the points which apply to my paper.

In view of the shortage of time I will put together the answers to points which have been referred to by several speakers.

It is always difficult with streptococcals, and particularly with *Str. faecalis*, to say that this or that is the cause of the pathological condition. I have always believed if you can fulfil Koch's postulates, which are as important to the clinician as they are to the laboratory worker, and nothing has superseded them, that you are reasonably sure the organism you have is the one which has caused the disease. We are very conscious of Dr. Hopkirk's point. We are satisfied that these streptococcals are pathogenic in that we can reproduce the condition in another animal.

Mr. Allen and another speaker raised the question of the activation of spores. I am perfectly satisfied in my own experience that we have to record the activation of spores, not just as a simple matter, but as a condition which is debilitating in a general way, as we have heard, in the pathogenesis of blackquarter in wet weather. It is very difficult to prove, one has to speculate a good deal. Most of us know how difficult it is to generalise from one organ to another. We can dispute toxin in a general way, for the last six months we have been trying to dispute *Welchii* spores. I do not know what is the fate of *Welchii* spores; we fed guinea-pigs and rabbits on *Welchii* spores, we failed to recover them, we do not know where they go.

You may think the point made by Mr. Hastie of academic interest, but I should not like to think the veterinary practitioner would become a mechanical instrument using a syringe without any information as to the contents of the syringe. This academic information I maintain is of the utmost importance to every member of the profession.

Mr. Allen asked if I had experience of black disease in cattle. I can only say not as a clinical entity, but it is significant that from black disease areas we recover a high percentage of latent spores from the livers of normal, healthy beasts of those areas. He also would like information in association of black disease with other animals. That is something we have been attempting; it is difficult from our present knowledge of the toxin content of animals to understand if we get an exactly identical lesion. All I can say is that I have failed at the present time to recover anything about the Type C strain of *Cl. oedematiens*.

I should be very unhappy if Dr. Wilsdon regarded the statement I made on enterotoxaemia as critical of the work that has been done in the past. That is not the intention, and in reading it over I do not see the criticism of past work, but I do think—as so frequently happens when you demonstrate a large clinical entity like enterotoxaemia, particularly in a classical way—we are all very liable to regard this classical type as being the last word in clinical knowledge. I am convinced this is not the case, and it is our duty to define once and for all the variations and deviations in any clinical entity if we are to progress in a systematic way.

On the other matter of *Cl. chauvoei* causing blackquarter, I meant to say that there was an opinion that *Cl. chauvoei* was not a frequent cause of blackquarter; I did not say it was my opinion.

One last point on the association of phenothiazine with lamb dysentery serum. That is something which is familiar to most Veterinary Investigation Officers. I have heard it discussed on many occasions, and the point raised was that if you dose the phenothiazine and administer pulpy kidney in the serum, you get a further increase. It is not beyond the bounds of speculation, indeed it is rational to believe that a great many may be recorded in a subclinical manner, but the difficulty is to prove it. More experience may prove it is a coincidence, and that the occurrence of remarkable outbreaks of pulpy kidney disease after dosing with phenothiazine is something which is incidental.

Mr. HUGHES: In reply to Mr. Davies, I do not think there is any evidence which suggests that one breed of sheep is more susceptible or more resistant to enterotoxaemia than another. While appreciating, as stated by Mr. Davies, that one reason for the increased value of an acclimatised hill flock is the habit of the flock to keep roughly within the confines of its own hill, I believe that the term has a wider meaning in the sense in which I have used it. In other words, that an acclimatised flock is in harmony with its environment (this was strongly supported by Mr. Stamp later, who drew attention to the value of sheep on tick-infested hills resistant to tick-borne diseases).

In reply to Mr. Allen, there is no doubt that the greater concentration of lowland sheep per acre will account for part of the difference in mortality rates between hill and lowland flocks. This may be the whole explanation, but until somebody has made a study of the causes of mortality in lowland flocks, including flocks with varying death rates under roughly similar conditions of concentration, it cannot be assumed that this factor alone is responsible.

In reply to Dr. Wilsdon, I can only say, as stated in the paper, that *Cl. welchii* Type C has been on occasion demonstrated in bowel filtrates. I am afraid I cannot help Mr. Hastie very much as I have not encountered subacute enterotoxaemia in sheep, although such a condition is not uncommon in goats. I also have met farmers who contend that the administration of pulpy kidney serum appears to improve the condition of healthy growing

lambs which have shown no signs of disease. I have never been able to test the truth of this statement; in any case it would be very difficult to prove the correctness of such a statement under field conditions. If it is true, I do not think the explanation is a simple one, as it is unlikely that the suckling lamb suffers from a protein deficiency. I agree with Mr. Wilson that the incidence of enterotoxaemia is greatest from October to April. The views expressed by him agree with those which I hold and it may be that one day it will be shown that the predisposing cause lies in some factor present in the plant and possibly in the relatively young pasture plant in which biochemical activity is great.

A number of speakers, including Mr. Barr, have commented on the apparent failure of phenothiazine to clear up effectively cases of parasitic gastro-enteritis in sheep. It may be true, as suggested, that the recommended dose of phenothiazine is too low to deal with the least susceptible worms. We have encountered outbreaks of parasitic gastro-enteritis in sheep which have received the recommended dose on a number of occasions. On *post-mortem* examination *H. contortus* has been absent and the lambs have carried large numbers of other worms. I believe myself that the present high value of sheep warrants the use of an increased dose. Like Mr. Carnegie, I sometimes suggest that phenothiazine should be alternated with copper sulphate and nicotine, but only in those areas where it appears possible that a deficiency of copper may exist, *e.g.*, in areas where swayback is prevalent. In reply to his query on the pathogenicity of tape worms it may be pointed out that it is common to find them in lambs killed in prime condition. In reply to Mr. John, I have had no experience of the condition characterised by a failure of the os cervix to open completely at parturition.

In reply to Dr. Montgomerie, we do not make a practice of examining smears from the bowel mucous membrane in suspected cases of enterotoxaemia. Unfortunately, many of our carcases are more than 12 hours old when the *post-mortem* examination is carried out. I imagine the examination of smears from the duodenum and the ileum in fresh carcases and an examination of the urine for the presence of sugar should prove useful aids to diagnosis. The latter test is a very simple one.

Mr. Rowlands: The main purpose of my contribution to the symposium has been to emphasise the need for accurate diagnosis. This I deem to be the first essential to the prevention and cure of disease, and consequently I feel that the papers have a practical significance for practitioners. It is wrong to consider isolating practitioner and research worker in watertight compartments. Laboratory work is nothing more than an extension of the practitioner's art of diagnosis carried on with more time and possibly better facilities available. I have chosen to describe a set of conditions with superficially similar symptoms which occurs not only in hill sheep in Wales, but equally commonly in the North of England, and can, therefore, be met with by Messrs. Barr and Carnegie.

The difficulty in making an exact diagnosis in many cases has, I hope, been sufficiently emphasised to satisfy Mr. Davies that it is difficult to give any suitable useful hints which may serve in the field as a means of differential diagnosis in the group of diseases to which he now specifically refers. Cortical cerebellar atrophy affects lambs at birth and is considered an hereditary condition. I am aware of another such condition described by Fraser Roberts—a type of muscular dystrophy occurring in new-born lambs. Whether or not the complexity of breid has been fully solved I am not quite certain, but in so far as North Wales is concerned, I feel reasonably sure that this is the case.

I would like to say that *Cl. welchii* Type C and its toxin have been isolated from sheep in N. Wales and is regarded as a cause of death in certain specific areas, and would add that I do not regard this organism with its greater invasive powers as giving rise to an enterotoxaemia in the specific sense of the term. Members will recall that the Chairman and I have done some work on the subject of enterotoxaemias as caused by *Cl. welchii* Type D. I am not aware that it has ever been regarded as an *infectious* disease in the strict sense. On the contrary, its description has always implied an essential pre-conditioning of the intestinal environment, possibly by the quality or quantity of the food, before symptoms of the disease are noted. I am in full agreement that this aspect of the condition should be reinvestigated.

In reply to the Chairman, I am not satisfied that the examination of stained smears of intestinal contents is of any real value in diagnosis. The most it could tell one is that there are present a large number of organisms similar morphologically to *Cl. welchii*. This, however, is likely to be the case when a sheep has died of diseases other than those caused by this organism.

In this connection may I just say how I have been impressed recently with the rather similar *post-mortem* findings in fatal cases of hypocalcaemia and/or hypomagnesaemia in which case an unidentified "toxin" is sometimes found in intestinal filtrates.

This leads me to say a word about the question raised in connection with pregnancy toxaemia. Here again diagnosis is a first essential and never really an easy matter. Clinically in ewes affected with so-called pregnancy toxaemia I regard grinding of the teeth and an "acetone" smell of the breath as differential symptoms, when otherwise hypocalcaemia may seem to cause confusion. It is always best to treat affected animals, even though the diagnosis is uncertain, with calcium, magnesium and glucose. These would, however, be of no avail in true pregnancy toxaemia.

In my opinion so-called pregnancy toxaemia is definitely a conditioned disease and can be brought about experimentally. It is not essential for pregnancy to be present. If ewes are over-fat in the first four to six weeks before lambing and suffer any sudden marked deprivation of food—or lack of movement, such as a sudden fall of snow or prolonged severe frost may cause—the condition will be likely to be precipitated. There are other points I would like to discuss, but time does not permit, and the other writers have dealt with them, or probably will do so.

Mr. Stamp: There are only one or two additions which I would like to make to the discussion. In the first place, I disagree that acclimatisation of sheep has nothing to do with disease. Most certainly there is good evidence that on tick-infested hills the bringing on of non-acclimatised sheep leads to a heavy mortality rate and a high incidence of abortion. With regard to the differentiation of abortion from infertility, I know it is often very difficult and I am unable to clarify the position. Undoubtedly there is a high incidence of infertility or early abortion in hill flocks in Scotland, the cause of which is unknown, although it is considered that it may be due to a mineral deficiency. I have little doubt that, as suggested, there are many non-specific causes of abortion, but it is very necessary to eliminate all the known causes before accepting a non-specific cause. Most certainly I know from experience that the assumed causation of enzootic abortion was very varied before the finding of the virus now known to be the real cause. Regarding the distribution of enzootic abortion in other areas than in the Borders, we have diagnosed the condition both in other areas of Scotland and in several areas of England, but there has as yet been insufficient time for its real distribution to be assessed.

The Chairman: This Association has always been very much indebted to the Press of this country, and there are still some representatives of the Press with us. I suggest that they have had evidence to-day that the veterinary profession is indeed interested in sheep diseases and able to effect a very high level of control. I am sure our friends of the Press will know I am not exaggerating the part which the profession can play but will realise that one of the preliminary steps is to get the confidence of the sheep farmer. The Press can do much to make the farmer realise that the veterinary surgeon is his friend and adviser; then the profession in this country will get a chance to do the job it is most anxious to do. The evidence of our great interest lies in the very fact that this large audience has remained in session for more than half an hour longer than it had any right to do! We have in the gentlemen who have contributed to this discussion individuals who have given us a lead, who have devoted their lives to the subject and are doing a thoroughly good job. Will you please join with me in showing our deep appreciation of their work. (Applause.)

Dr. Jamieson: I have been given the privilege of expressing the appreciation of all of us on the platform of the way in which the four papers have been received; the discussion has left no doubt that we in the veterinary profession have the welfare of the sheep industry at heart and are able to cope with these diseases. Thank you.

ROYAL SANITARY INSTITUTE'S 1951 CONGRESS AT SOUTHPORT

Mr. David E. Orr, M.R.C.V.S., Chief Veterinary Inspector, Manchester, has been appointed President of the Veterinary Hygiene Section of the Royal Sanitary Institute's Health Congress, to be held at Southport from April 23rd to 27th, 1951. Other Presidents among the eight sections include Sir John Charles, M.D., B.S., F.R.C.P., D.P.H., Chief Medical Officer, Ministry of Health (Preventive Medicine); Mr. A. L. Bacharach, M.A., F.R.I.C., Chairman, Food Group, Society of Chemical Industry (Food and Nutrition (in conjunction with the Food Group, Society of Chemical Industry)), and Dr. T. H. Davey, O.B.E., M.D., B.CH., D.T.M., Professor of Tropical Hygiene, University of Liverpool (Tropical Hygiene).

XUM

REPAIR OF FRACTURES IN THE RACING GREYHOUND BY MODERN METHODS

BY

HAMILTON KIRK, M.R.C.V.S.,

London, N.W.

It is safe to say that only one or two years ago many of the very serious fractures sustained by small animals would have been regarded as beyond hope and the anima's destroyed. Examples are (1) complete mid-shaft break of the femur with gross over-riding; (2) compound comminuted fracture of both radius and ulna—the leg hanging only by skin and tendon; (3) humerus smashed just above the elbow joint; (4) complicated pelvic fractures, etc., etc.

Very fortunately, nowadays nearly all of the gross fractures can be successfully dealt with—thanks to the methods elaborated or perfected in America, combined with the use of penicillin discovered in Great Britain. I have charge of three London greyhound-racing stadia, and the amount of orthopaedic surgery arising therefrom is very considerable. Many of the greyhounds are valued at high figures, not infrequently over £1,000 apiece, and it seems essential that a track veterinary surgeon should be able to deal efficiently with formidable accidents.

Through restrictions and austerity, and the difficulty or impossibility of acquiring the necessary apparatus, few of us (until now) have had the opportunity of practising the art of bone synthesis by the proved and accepted modern methods. Plaster casts have been excellent up to a point; but when a bone has been thought to be set and has been plastered, a subsequent radiograph has often shown the reduction to be imperfect. For a pet dog, some slight lameness, or shortness of a limb, in after-life might not be regarded seriously, but for an animal whose value depends on sound limbs, more precise methods must often be employed.

Since the last international veterinary congress, much attention has been directed to these methods and, personally, I have been completely satisfied with the results of these. Almost my first attempt at the use of metal plates to fractures was in the repair of a broken os calcis of a greyhound. Fig. 1 shows how the calcis was pulled out of line. In the old days, by plaster-cast methods, that angulation would have remained practically the same. Fig. 2, however, portrays how well the original contour of the hock was maintained by the screwing on of a vitallium plate. In this, as in other cases, there were no constitutional complications (thanks to careful asepsis and penicillin) and union was uneventful.

Six weeks ago one of the well-known "Trev's" greyhounds completely shattered the humerus just above the elbow joint, as one result of which there was an immediate paralysis of both sensory and motor nerves, and within two or three days, an almost entire atrophy of the supra- and infra-spinatus muscles. It looked a hopeless case, and one quite unsuitable to intramedullary pinning, metal plating or plaster casting. The only method of likely value was the Kirschner-Ehmer pinning method, and by great good fortune, Mrs. Robertson, M.R.C.V.S. (recently over from America with a set of these instruments), very kindly not only loaned the apparatus but advised and helped in its application.* Figs. 3 and 4 show well the pre- and post-operative conditions. The prognosis looked unhopeful in view of the paralysis, so that at the end of a week I instructed the hospital staff to apply a sinusoidal galvanic current every day for five minutes. Two weeks of this effected a most remarkable improvement, the paralysis having disappeared and the shoulder muscles refilling. To-day (September 23rd—six weeks after the accident) the dog is running about freely with only a moderate lameness discernible—which, however, will probably also disappear. Trainers and other members of the staff were amazed at such a result, and not least in the fact that the complicated splint (like a scaffolding on a house) seemed to cause the dog neither embarrassment nor pain. I should have mentioned earlier that reduction of the fragments was effected only with the greatest difficulty and patience by the "open" method, although this was not attempted until 13 days had elapsed to allow some of the swelling to subside. Needless to say, there was a great amount of bruising, blood clot and haemorrhage, all of which complicated and hindered the proceedings.

On September 9th another very promising young greyhound sustained precisely the same injury, though if anything even worse than the first one—as will be appreciated by a glance at Fig. 5. On September 12th I repeated the operation, and in spite of gross bruising and swelling, was able to reduce the fragments to their positions as portrayed in Fig. 6.

To-day this bitch is in excellent fettle, even attempting to bear weight on the fractured limb, although still in Kirschner-Ehmer splints. By about October 5th these splints will be removed and I have every confidence in the outcome. A Siamese cat and a terrier dog similarly treated are now perfectly sound.

Opportunity is awaited to try out one or other of these methods on horses with fractured bones, especially as Mr. Clement Fennel and I were able to plate a fractured os calcis of a year-old bull. Some three months later he served his first cow.

I feel confident that a proportion of equine fractures could be successfully treated by screwing or plating the fragments together and then supporting the whole by a massive plaster cast. Plenty of leg or foot injuries other than fracture are severe enough to cause a horse to be unable to stand on that leg for two or three weeks; and whether or not slings are used, the animals come through the ordeal—as they also could in cases of fracture. Obviously each case would have to be considered on its merits, and in the light of X-ray examination.

* Mrs. Robertson has had considerable experience in fracture repair by Kirschner-Ehmer splints and no doubt will rank among the few pioneers in their use.

Artificial Insemination: Committee on Exports and Imports of Cattle Semen.—The Minister of Agriculture and Fisheries and the Secretary of State for Scotland have appointed Mr. R. H. Watherston to be a member of the Committee (of which the Rt. Hon. Lord Oaksey, D.S.O., is the Chairman) to advise on the considerations which should govern the granting of licences for the export and import of cattle semen for the purposes of artificial insemination. Mr. Watherston, who farms at Crichton Mains, Ford, Midlothian, is a well-known breeder of Shorthorn cattle and has judged cattle at shows in the Argentine. His appointment has been made in consequence of the resignation of Mr. Duncan M. Stewart, O.B.E., of Millbills, Crieff, Perthshire. Mr. H. L. Shrimpton, M.C., Chief Livestock Husbandry Officer of the Ministry of Agriculture and Fisheries, has succeeded Mr. H. Twinch, O.B.E., as an assessor to the Committee, following Mr. Twinch's retirement.

* * * * *

"At the Farmer's Service."—All the services and other forms of assistance which the State provides for farmers to-day are summarised by the Ministry of Agriculture and Fisheries in a handy reference book of 36 pages. It is entitled "At the Farmer's Service," and may be obtained free on application to any County Agricultural Executive Committee.

* * * * *

Weekly Wisdom

Food is wealth, the most primary form of wealth.—"L. M. F." in *The Farmer & Stock-breeder.*

FIG. 1

FIG. 2

FIG. 3.

FIG. 4.

FIG. 5.

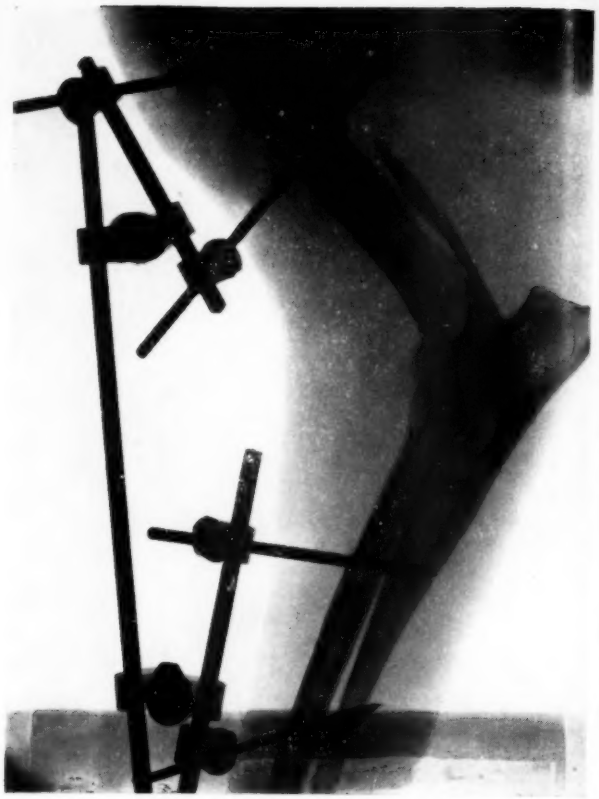

FIG. 6.

FIG. 1.—Greyhound's Os Calcis fractured transversely and vertically. The author's metal (temporary) splint is in place

FIG. 2.—Lateral view after plating.

FIG. 3.—Comminuted fracture distal end of greyhound's humerus. X-rayed through temporary plaster cast.

FIG. 4.—Same animal as in Fig. 3. After several attempts at reduction, each one X-rayed, this satisfactory result was at length effected.

FIG. 5.—Greyhound's completely shattered elbow.

FIG. 6.—Same dog as in Fig. 5. After "open" reduction, the fracture pinned by Kirschner-Ehmer splint. The dog is quite happy wearing this apparatus and makes no attempt to interfere with it.

FIG. 7.—Photograph of greyhound wearing the Kirschner-Ehmer splint.

CLINICAL COMMUNICATION

THE TREATMENT OF *CORYZA INFECTIOSA GALLINARUM* TYPE II (NELSON) WITH STREPTOMYCIN

PROFESSOR Dr. L. DE BLIECK,

Utrecht

In a report which was laid before the Eighth International Poultry Congress, 1949, and which was published in the *Tijdschrift voor Diergeneeskunde*, 1948, No. 24, I set forth the ideas then prevailing in regard to *Coryza infectiosa gallinarum*.

Since then, little has been published afresh on this subject, but mention may be made of the research by W. E. Smith, J. Hillier and Stuart Mudd, who studied the morphology of the cause of coryza—of slow onset and long duration—which I called Type II. They describe this research as " Electron Micrograph Studies of two strains of Pleuropneumonia-like (L.) Organisms of human derivation " in the *J. Bact.* **56.** 5, November, 1948.

These causal organisms, which used to be defined as " coccobacilliform bodies " (Nelson), according to the authors should be classed in the group of pleuropneumonia-like micro-organisms, the principal representative of which is that causing pleuropneumonia of cattle. Moreover, the organism responsible for agalactia of goat and sheep should belong to the same group, while quite a number of the species has been found in dogs, rats, mice and men. I propose to deal with this in another publication, confining myself here to the therapy of coryza, Type II.

In my last paper, mentioned above, I pointed out that, up to the present, a specific cure has been known only for coryza, Type I, *i.e.*, the sulphanilamides and sulphapyridine, in particular, sulphathiazole. In the course of the last two years other preparations, such as neo-uliron and argyrophédine, have been tried out, and, of the antibiotics, penicillin and expansine. No therapeutic result could be registered, either *per os*, or when parenterally administered.

In cultivating the cause of coryza Type II in eggs, both penicillin and streptomycin were used. It appeared that penicillin had no action on the causal organism, but that streptomycin destroyed it. I then tried to treat sick animals with streptomycin. Success was achieved, and I give some particulars of my experiments.

The duration of the illness varies from a few to 19 months ; most experiments have been made with hens which had been artificially infected, but a few cases from practice also have been treated.

1. Two adult birds, " Noord-Holland " Blue, infected on 23.2.50, showed on 6.4.50 a marked discharge from both nostrils. One of them (No. 694) has been kept as a control and at the time of writing (21.5.50) still suffers from nasal discharge. Subsequently streptomycin was used, also dihydrostreptomycine (sulphate). One gramme of the powder, containing 1,000,000 units, was dissolved in 10 c.c. physiological NaCl-solution. Various quantities of this solution were injected intramuscularly. On 16.3.50 No. 693 was given 0·3 c.c. streptomycin, and on 18.3.50 a further 2 c.c. The nasal discharge ceased on 21.3.50.

The bird has been kept under observation since and has remained negative. There was no reaction on injection, and the bird remained perfectly healthy. The same holds good for all cases to be mentioned hereafter.

2. Spontaneous cases from practice. Here the duration of the symptoms was unknown, but not longer than eight days. All birds showed a profuse bilateral discharge. Numbers 6741, 6695, 6497 and 6498 were given, respectively, on 1.4.50, 2 c.c., 1½ c.c., 1 c.c. and ½ c.c., intramuscularly. The first two were completely cured after three and four days respectively. The remaining two were still positive on 11.4.50 and were then treated respectively with 1½ and 1 c.c. DHSM. No. 6497 was cured after four days ; No. 6498 remained positive and on 1.5.50 was intramuscularly injected with 2 c.c. DHSM, suspended in oil and wax. After three days recovery could be observed, but four days afterwards a slight relapse occurred. On 17.5.50 the discharge had stopped entirely. No. 6681, kept as a control for the time being, on 11.4.50 was given 1 c.c. DHSM intranasally. It was impossible, however, to inject the liquid deep enough. On 18.4.50 there was no improvement. The bird then received 2 c.c. DHSM intramuscularly. The discharge diminished but did not stop, and on 5.5.50 was still in evidence, though exudate could be produced only by pressure. After six days the bird was cured.

3. Nos. 703, 704 and 706, four months old, W.L., were intranasally infected on 6.4.50. Bilateral discharge, 21.4.50 and 25.4.50. On 1.5.50 all birds received 2 c.c. DHSM (No. 706 DHSM in oil). After two and three days all the birds were cured ; the symptoms have not recurred to date.

4. No. 674, one year old, W.L., was infected 21.4.50 ; positive discharge on 8.5.50, which increased. On 17.5.50 2 c.c. DHSM intramuscularly ; 19.5.50 cured.

5. In order to increase the virulency and thus shorten the incubation period, ten N.H. Blues, ten weeks old, were infected intranasally on 27.4.50. Three of them were positive on 11.5.50. The others became positive later. The result of the treatment of the first three cases is now known.

In order to ascertain whether, with these young birds, the dose of DHSM might be diminished, they were injected, 15.5.50, with respectively 1½, 1 and ½ c.c. DHSM intramuscularly. The first two were negative after two days and remained so. The chicken injected with ½ c.c. DHSM was still positive on 17.5.50 ; 1½ c.c. DHSM was then injected, following which the bird was cured after two days.

Conclusion

It appears possible that hens suffering from coryza Type II —generally characterised by a persistent and slow course— are cured completely within two or three days by intramuscular injection of 2 c.c. dihydrostreptomycine (sulphate). For young birds 1 c.c. DHSM may be sufficient. With smaller doses one risks the causative organism becoming resistant to DHSM. Possibly this might be prevented by giving frequent injections at short intervals. I did not try this method, the adoption of which, I fear, would render the treatment very expensive and rather impracticable. The present cost of the DHSM inoculation process as employed by me is 75 cent. (200 mg.) per chicken.

To date no unfavourable consequences of the injection have been observed. An adult cock, experimentally injected with 2 c.c. DHSM, intravenously, collapsed for about one minute, recovered almost immediately and quietly went on feeding.

Recently in a fire which broke out early in the morning in one section of Hackbridge boarding and quarantine kennels, at Wallington, Surrey, 24 dogs and two cats were lost. Mr. E. W. Fawcus, the kennels manager, said that the night watchman, Mr. H. Thompson, fought his way through dense smoke and flames to release " every animal it was humanly possible to save," but the others were entombed when the roof collapsed.

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Following reported injuries to calves and other farm animals, Dublin Co. Council are calling on the Government to prohibit the sale of air guns.

QUESTIONS AND ANSWERS

The submission of questions for inclusion in this column will be welcomed; they can relate to any aspect of veterinary work. For purposes of record, each question is numbered, and those submitting questions are required to furnish (not for publication) name and address.

Answers to readers' queries represent exclusively the personal opinions of the writers, and criticism of the replies will be appreciated.

All communications should be addressed to the Editor.

Chronic Respiratory Disorder in a Hunter

Q. 367.—*What treatment would you recommend for a 14-year-old thoroughbred hunter gelding which has been suffering from a chronic pharyngitis, laryngitis or tracheitis, characterised by a spasmodic nasal discharge and cough. The discharge, which generally becomes evident only after exercise, is white and mucoid. The cough is intermittent. The condition has now been apparent with fluctuations in degree for over a year.*

Treatment so far tried without benefit includes penicillin in million unit doses t.i.d., *for four consecutive days; mixed strangles vaccine; autogenous vaccine; daily 3iii doses of Mist. Tussis (Bruasco) for a fortnight.*

A.—Prognosis is not good in this case as, though the infection is most apparent in the upper respiratory tract, there will almost certainly be some lung infection and probably a degree of bronchiectasis. If this is so, the intermittent cough will remain even though the infection may be cleared up.

If treatment is to be continued, in spite of an unfavourable prognosis and the age of the animal, it would be as well to identify the causal organism from throat swabs taken with the help of a gag. Nasal swabs are likely to be heavily contaminated. The organism will almost certainly prove to be a streptococcus. This knowledge will encourage the veterinary surgeon and the owner to pursue a line of treatment to extreme limits with some confidence.

Penicillin must be used in large doses and over a long period. The animal's body has had plenty of time to organise its defences, including a chronic thickening of the infected membranes which makes access for the drug to infected foci more difficult. A number of stubborn cases, though not of twelve months' standing, have been cleared up with 3,000,000 units of penicillin intramuscularly twice a day for five days, followed by a course of sulphamezathine orally (2 oz. as initial dose and ½ oz. twice a day for four days). Then repeat the penicillin and so on until all discharges have ceased. Vaccine treatment has not been found to be satisfactory in these chronic cases. "Bruasco" is helpful and could be used during the treatment outlined above.

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Post-operative Treatment in Caesarean Section in the Bovine

Q.368.—*In Caesarean section in the bovine, what post-operative treatment should be adopted to prevent peritonitis, etc., and is the ventral site preferable to the flank method of operation? What is the best method of protecting the operation wound during healing?*

A.—(1) In my opinion peritonitis is most likely to develop as a result of infection from the uterus rather than from the skin and muscle wound, and is readily caused by too much forced traction on the foetus before Caesarean section is resorted to. I give pituitrin into the uterine muscle when the foetus has been extracted, but the more expensive ergometrine might be preferable. The placenta should always be removed if at all possible and sulphanilamide put into the uterus, which is closed by a double row of interrupted Lembert sutures. A course of sulphanilamide is given by mouth prophylactically and penicillin could be tried if peritonitis were suspected.

I prefer the left flank incision extending nearly to the milk vein as no trouble is then experienced with small intestine complicating the manipulation of the uterus. No special protection is used for the wound apart from B.I.P.P. if flies are troublesome.

A.—(2) The organism most commonly associated with sepsis in the bovine, *Corynebacterium pyogenes*, is not susceptible to sulpha drugs, but to penicillin, as also are streptococci, staphylococci and clostridia. It is the writer's practice to inject the contents of four or five tubes of penicillin procaine in oil (intramammary tubes) into the peritoneal cavity before closure. The contents of further tubes are applied to the muscle wound.

On completion of the operation 1,000,000 units of penicillin procaine are injected intramuscularly, and repeated daily for three to five days according to the progress of the case.

The operation site of preference is roughly parallel with, and a few inches lateral to the mammary vein on the left side. In this situation, there is no trouble with loops of small intestine obstructing manipulation of the uterus.

The writer usually applies a pad of gauze over the wound and sutures it to the skin. A fly repellent is necessary in the summer.

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Lucerne: Hay or Silage?

Q.369.—*A farmer has sown a fairly large acreage of lucerne, which he intends to use as winter feed for his milking herd. The crop can be saved as hay or silage: which will give the better value?*

A.—Lucerne, if properly harvested as either first-class hay or well-made silage, will produce approximately the same quantity of nutrients per acre. If a large acreage of lucerne is available this should be divided about equally between hay and silage, both to spread out requirements of labour in summer and to supply the necessary variety of foods for winter use. High quality lucerne products will only result if great care is paid to their making, *e.g.*, when haymaking use tripods (eight to ten per acre) to prevent loss of leaf and when silage making use molasses as lucerne is a high protein crop.

. . . . . .

Canine Dietary Regime

Q.370.—*Could you suggest the correct feeding of a dog from birth and suggested quantities, with a view to lecturing to canine societies on the subject?*

A.—The available information is so extensive that it is impossible to summarise it satisfactorily in a short reply. You would be well advised to obtain a copy of Professor Clive M. McCay's text-book, the *Nutrition of the Dog*, the second edition of which was published last year (1949) by the Comstock Publishing Co., Inc., Ithaca, New York, and copies of which may be obtained through Messrs. Bailliere, Tindall & Cox, 7 and 8, Henrietta Street, Covent Garden, London, W.C.2, price 27s. 6d. This text-book, which will provide detailed material for the lectures that you mention, was reviewed in *The Veterinary Record* for September 30th, 1950 (Vol. **62.** p. 584).

An extensive abstract summarising various papers on the feeding of dogs appeared in the issue of *The Veterinary Record* of July 12th, 1941 (Vol. **53.** pp. 402–404).

The bus service in Skye is to be curtailed owing to the small amount of traffic and poor condition of the roads. £1,000 has been spent on broken springs in 38 weeks. It is thought that horses may replace the buses.

ABSTRACTS

[Studies on the Vaccination of Cattle as a Measure against Infection with Tuberculosis with the Living Vole Acid-fast Bacillus. YOUNG, J. A., & PATERSON, J. S. (1949.) *J. Hyg.* **47.** No. 1.]

These extensive experiments cannot be fully abstracted but experiment H may be given as one example.

Heifers were vaccinated with 5 mg. of strain LV 285 intravenously and exposed almost at once to heavy natural infection. The vaccinated animals possessed a marked resistance to infection as compared with the unvaccinated control animals. No infection was found in six out of eleven vaccinated animals, whereas ten out of twelve controls were infected. Two vaccinated animals were free from infection when examined three years and three months and three years and six months respectively after first exposure to field infection, whereas no control was free from infection after 18 months on the farm. Nevertheless, in four out of the five vaccinated animals which did become infected, the lesions were severe, even more severe, on the average, than the lesions in the control animals. Further experience of work under field conditions might suggest that this was merely due to chance, but the possibility cannot be overlooked that intravenous vaccination with a relatively avirulent strain may not result in a balanced state of resistance in which there has been an equal stimulation of the various factors which combine to form the defence mechanism. There may even be an initial over-stimulation of certain tissues or cells with a subsequent loss of functional efficiency which would become apparent only in long-term experiments embracing large numbers of animals.

Vaccination by multiple puncture of the skin (as used in man with the vole bacillus) produced irregular and weak protection, although it was shown that bacilli were carried onto the vascular layers of the skin by the technique employed.

Reviewing all the vaccination experiments it was concluded ithat lesions in vaccinated animals tended to be granulomatous and partly encapsulated and those in the unvaccinated were invasive. A comparison of the various results obtained in these studies shows that, as with other types of tubercle bacilli, different strains may vary in virulence and the virulence of one strain may vary. The authors emphasise the importance of these facts in relationship to vaccination of man.

The macroscopic lesions produced by the intravenous injection of 5 mg. of vole acid-fast bacilli LV 285 (experiment M) were slight, but the bacillus was recovered from the lungs and thoracic glands up to 84 days after injection : the last date examined. In experiment B strain G 564 was recovered 18 months after injection.

Histologically, giant cells were found in the thoracic gland of a calf killed on the 28th day. Macrophages filled with acid-fast material were seen in the thoracic and mesenteric glands, the liver, spleen, kidney, meninges and the udder. The occurrence of typical tuberculous changes following vaccination with the vole bacillus is uncommon, even when cultures of high virulence are inoculated intravenously. Such tubercles as are produced are not of great cytological complexity, and they occur almost exclusively in the lungs and thoracic glands. They do not progress to a stage showing central necrosis, and the bacilli are difficult to find after 14 days, at which time one may find bacilli lying in or around loose aggregations of epithelioid cells which lack the classical features of tubercles, while later, at 28 days, one may find fully formed tubercles which lack the evidence of associated acid-fast bacilli. This picture differs from that seen in calves inoculated with B.C.G., for in these animals fully formed tubercles containing acid-fast bacilli can be found with ease at 14 days, whereas at 28 days the tubercles are markedly regressive. In spite of the fact that the lesions in vole-vaccinated animals are slower in forming than those in animals inoculated with B.C.G., they do not persist long, and in a matter of weeks they disappear. Injection of the vole bacillus produced a general increase in size and "activity" of the cells of the reticulo-endothelial system.

Vaccination produced considerable malaise, anorexia and sometimes severe lameness. A special examination of these lesions in the joints was made by Dr. D. V. Davies. No lesion even suggestive of tubercle formation could be identified in the joint tissues. The lesions, however, did resemble those which have been described in the joints in serum sickness, allergy and anaphylaxis. The vascular reaction and that of the synovial lining cells were very similar. The time of development of the joint lesion in the present series lends support to an allergic basis for the lesions, whilst the rapidity with which the lame animals improve and lose their lameness is also suggestive.

The authors conclude that vaccination obviously increases resistance to the tubercle bacillus and suggest that, provided always there are facilities for the segregation of young stock, the entire milking herd of a self-contained farm could be replaced with fresh stock within a period of four years, the oldest animals being eliminated as fast as young vaccinated animals become available to replace them. Once the turnover of the milking stock was completed no further vaccinations would be carried out, but in their turn during the following four years the vaccinated animals would be replaced with unvaccinated animals. The immunity produced by a single dose of 5 mg. is not really adequate in all animals but the dose should not be increased because "the vole bacillus is not the innocuous organism that it was at first considered to be." To get the best immunity animals should probably be re-vaccinated four to six months after primary vaccination but *before* exposure to infection. It is argued by some workers in favour of B.C.G. vaccination of human beings that vaccination gives the body time to develop resistance against the virulent tubercle bacillus. The authors point out that this may hold good for human beings in whom there is unquestionably a much greater capacity for spontaneous recovery from tuberculous infection than exists in cattle, but in none of the authors' experiments on cattle have they found any evidence that the mechanism of resistance is rendered in the long run a more effective defence against the virulent tubercle bacillus as a result of vaccination. Indeed, what evidence they have is to the contrary.

J. F.

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[Diseases of Domesticated Animals Constituting a Hazard to Mankind. BODDIE, G. F. (1950.) *The Practitioner.* **165.** 67–74.]

In this article Boddie discusses those diseases the infection of which is usually spread by more or less direct contact between the affected animal and the susceptible human being. It is shown that the intimate contact between human beings and animals is bound to lead to parasites and bacteria being transmitted from the animal to its human owner. Skin diseases which are readily transmissible are ringworm, favus and sarcoptic mange. Ringworm, especially, commonly invades the skin of children who may handle infected calves. In the case of sarcoptic mange of the dog an incident is recorded in which every member of a family acquired sarcoptic mange from a puppy purchased as a Christmas present. Tuberculosis in the dog may be of human or bovine origin, although this disease is not so common in the towns as a

result of the improvement in milk supplies. Canicola fever may be acquired by human beings when mopping up the urine of an infected dog, the cloth being wrung out with naked hands. Louping-ill spread by ticks has been recorded both in shepherds and laboratory workers. Cow-pox, now an uncommon condition, has occurred in cattle as a result of contact between a recently vaccinated person and the cattle at milking. Tapeworms of dogs are frequently transmitted to both children and adults, the tapeworm *Dipylidium caninum* being passed through its intermediate host the dog flea.

Professor Boddie concludes by pointing to the value of co-operation between veterinary surgeons and medical practitioners in the differential diagnosis of human disease in which an animal is a possible source of infection.

G. C. B.

REVIEWS

[Physikalische Tiermedizin. (Physical Veterinary Medicine.) By Dr. O. Eggert. Vol. 1. pp. 187. Published by F. Enke, Stuttgart, 1950. (No price stated.)]

This book has been written in order to fill a gap in the array of veterinary text-books which are available for modern study, as hitherto no single book has been devoted exclusively to physical therapy.

This first volume of Eggert's book has two main parts—general and special, the former giving information on the physiological actions of heat, cold, water, light and radium rays upon animal tissues, and the latter dealing with the physical therapy of external and internal diseases, particularly of the horse. There are over 100 figures and photographs.

The most important use for physical therapy consists of the local treatment of inflammation by cold, heat or moisture. In many conditions such treatment represents the best treatment of, for instance, acute or chronic traumatic injury to the limbs of horses, but in those associated with bacterial infection it must be admitted that the comparatively recently discovered sulphonamides and antibiotics have rendered physical therapy obsolete, or at best subsidiary. This is not admitted by the author, as he discusses both classes of injury as if the main reliance rested on physical methods.

However, as a text-book on physical therapy, the book has covered the ground very well, and it can be recommended as a reliable source of information.

The book itself is well up to the best standard of the book publisher's art.

* * * * *

THE PONY CLUB ANNUAL (1950)*

This is a well-balanced compilation of articles, covering a wide range of aspects relating to horsemanship and horse-mastership, ethics and equipment. While some of the information is, of necessity, very elementary, the reader will wish that, in some instances, it had been more extensive.

The quality of the production is very high—good type for easy reading, admirable drawings, and photographic plates of very high order. The hope of the Chairman of the British Horse Society that the reader will find the Annual "interesting, informative and enjoyable" will, without doubt, be fulfilled.

This first issue has set a standard which will make us look forward to future publications with keen anticipation. An excellent yearly Christmas gift.

* The Pony Club Annual. Published for The British Horse Society by The Naldreth Press. 144 pp. with illustrations and 32 plates. Price 10s. 6d. net.

JAMES CLARK MEMORIAL CEREMONY, CANONGATE KIRKYARD, OCTOBER 18th, 1950

The ceremony of unveiling the Memorial to James Clark was carried through in a manner that was as deeply impressive as it was simple and dignified.

The company, which was largely composed of members of the Veterinary Profession, numbered between 60 and 70. The procession from the Kirk to Clark's burial place was led by Sir Andrew Murray, Lord Provost of Edinburgh, followed by the Reverend Mr. R. Selby Wright, Minister of the Canongate. Professor Thomas Dalling, President of the Royal College of Veterinary Surgeons, and Mr. W. G. R. Oates, the Registrar, were preceded by the mace of the Royal College. The Scottish Veterinary Colleges were represented by Principal W. M. Mitchell, Royal (Dick) Veterinary College, and Mr. J. W. Emslie, deputising for Mr. W. L. Weipers, Director of Veterinary Studies, University of Glasgow; Professor T. J. Mackie represented the University of Edinburgh; the Department of Agriculture for Scotland was represented by Sir Patrick Laird, C.B.; the Animal Diseases Research Association by the President, Mr. G. G. Mercer, C.B.E., and the Old Edinburgh Club by Sir Francis Grant, K.C.V.O., formerly Lord Lyon King of Arms.

At the burial place, Dr. J. Russell Greig asked the Lord Provost to deliver the oration. The Lord Provost responded:

"We are met to-day to do honour to a man whose outstanding personality, high ideals and splendid contribution to Veterinary Science have made him great.

"His body has long lain here in an unmarked and unknown grave; albeit it rests with those of a goodly company.

"Edinburgh is rightly known and widely esteemed as a great centre of Culture and Learning, and the times of James Clark, the days of the 18th and early 19th centuries, mark the dawn of a golden age when in the Arts, in Literature, in Medicine and in Science, Edinburgh produced so many men of such outstanding quality and achievement that the City was characterised, aptly enough, as a 'veritable hot-bed of genius'; and here in this God's Acre of the ancient Kirk of the Canongate lie several of those whose names are held in world-wide renown.

"But here, too, was one who was forgotten; indeed, until but recently, his very name was unknown, not only to the citizens of Edinburgh but to the great mass of the members of his own profession. But here was one who, in fact, did revolutionise men's concepts of Veterinary Medicine; indeed, he raised these from the dark pit of ignorance and superstition and placed them on the Altar of Science, for we now know that it was Clark—more than anyone—who formed the solid basis upon which Veterinary Science in Britain has been built up throughout the long and laborious years; and surely it is a thing not only to be remembered, but a thing for wonder that the magnificent contributions derived from Clark's life-work were made some half century before the Royal College of Veterinary Surgeons received its Charter and that great and beneficent body, the Veterinary Profession, came into being.

"To-day, as never before, the services of the Veterinary Profession are deeply appreciated—its services in conserving the Public Health; its services to Agriculture; in safeguarding the people's food and in promoting the Cause of Humanity by its prevention of sickness and pain in the brute creation. These are *accepted* to-day but they were the *ideals* of James Clark, and the Memorial about to be unveiled not only marks his last resting-place but will serve to hold him in abiding memory. May that memory be an inspiration for those who are yet to come."

JAMES CLARK MEMORIAL CEREMONY

—George Outram & Co., Ltd., Glasgow.

Procession to Burial Place.

—Edinburgh Evening News.

Dr. J. R. Greig asks the Lord Provost to receive Memorial into the Safe Keeping of the City.

Dr. Russell Greig then asked the President of the Royal College of Veterinary Surgeons to unveil the Memorial. After the unveiling Professor Dalling read aloud the inscription on the mural plaque :—

JAMES CLARK
A GREAT
VETERINARY PIONEER
BORN 1732—DIED 1808
ERECTED TO HIS MEMORY
BY MEMBERS OF THE
VETERINARY PROFESSION
IN GREAT BRITAIN AND
AMERICA. 1950.

Dr. Greig then asked the Lord Provost to receive the Memorial into the safe keeping of the City. The Lord Provost graciously accepted.

Dr. Greig then laid a personal wreath upon the Memorial. The wreath, which was composed of a simple garland of laurels grown at Moredun Institute, carried the entwined colours of the City of Edinburgh and the Royal College of Veterinary Surgeons, and bore the inscription "*Habebitur in Memoriâ.*"

The ceremony concluded with a prayer of dedication by the Reverend Mr. Selby Wright.

The design of the memorial bronze plaque was the work of Mr. Thomas Good, Edinburgh.

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It should be added that Dr. Russell Greig's search for Clark's grave extended over many years. Failure to find it, easily, was due to the fact that several of the old burial records had been destroyed. He found it eventually through the help of his friend the late Mr. John Russell, one of the leading authorities on Old Edinburgh. It subsequently proved that Clark's daughter Elizabeth (Mrs. Watson) and her family, including Clark's grandson, Sir John Watson Gordon (*vide Vet. Rec.* 1948. **60.** 662), are interred in the adjoining grave.

QUESTIONS IN PARLIAMENT

CIVIL DEFENCE (ANIMALS)

Lieut.-Col. Sir THOMAS MOORE (December 7th) asked the Secretary of State for the Home Department what arrangements have been made or are contemplated to deal with the protection or humane destruction of animals in the scheme for Civil Defence.

THE UNDER-SECRETARY OF STATE FOR THE HOME DEPARTMENT (Mr. GEOFFREY DE FREITAS): I am considering this together with my right hon. Friend the Minister of Agriculture. Later the veterinary profession and the appropriate voluntary societies will be consulted.

Sir T. MOORE: Will the hon. Gentleman bear in mind, in framing the instructions, the chaos that existed at the beginning of the last war through lack of foresight in issuing the necessary instructions?

Mr. DE FREITAS: That is being considered at the moment.

Mr. H. HYND: Will my hon. Friend also try to avoid bringing about indiscriminate slaughter of household pets, as happened when the last air raids took place?

Mr. DE FREITAS: Yes, Sir.

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HORSES (TRANSPORT)

Mr. SUTCLIFFE (December 7th) asked the Minister of Agriculture the result of his consultations with the British Transport Commission and the Road Haulage Association about the introduction of amendments to the Exportation and Transit of Horses Order, 1921, and the Transit of Animals (Amendment) Order, 1931, arising from the Report of the Rosebery Committee.

THE MINISTER OF AGRICULTURE (Mr. THOMAS WILLIAMS): Following consultations with the Ministry of Transport, the Railway Executive and the Road Haulage Association, an order to give effect to the recommendations of the Rosebery Committee concerning the transport of horses by rail and road has been drafted, and is now being circulated to those bodies for their final observations.

Mr. SUTCLIFFE: Can the Minister say if the orders will implement all the recommendations contained in sub-paragraphs (*u*) and (*w*) of the Rosebery Committee Report?

Mr. WILLIAMS: I cannot be sure off-hand, but if the hon. Member will wait just a short time I think the order will be available and he will then be able to see what it contains.

Mr. SUTCLIFFE: If the orders implement those recommendations the Minister's action will be welcomed throughout the country.

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WILD ANIMALS (REPORT)

Mr. JANNER (December 7th) asked the Secretary of State for the Home Department when it is expected that the Report on British Wild Animals will be issued.

Mr. EDE: I am informed that the Committee hope to submit their Report early next year.

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SLAUGHTERHOUSES

Lieut-Col. BOLES asked the Minister of Food whether he will invite representatives of the Animal Health Division of the Ministry of Agriculture and Fisheries to take part in the discussions now proceeding about conditions in some Government-controlled slaughterhouses.

Mr. F. WILLEY: Complaints about the conditions in some of the slaughterhouses which my Department is using are generally due to unsuitability of siting or design. We work in close co-operation with the Agricultural Departments on all these matters.

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SLAUGHTERHOUSE FACILITIES

Mr. DYE (December 4th) asked the Minister of Food whether he is in a position to make a statement on the increased slaughterhouse facilities that he hopes to provide for next year's peak production of livestock.

Mr. WEBB: I hope that the two experimental slaughterhouses at Fareham and Guildford will be completed by next autumn. As I have already said, we are encouraging local authorities to build slaughterhouses at places where existing facilities are seriously inadequate and where there seems to be a permanent need for new slaughterhouses, but I cannot at present say whether any of these will be completed in time for the next peak season.

Mr. DYE: Will the local authorities be able to proceed with these plans and the building of new slaughterhouses during next year, ready for the peak period in the autumn?

Mr. WEBB: That is my hope, and if all goes well I think that will take place—in some cases.

Sir HERBERT WILLIAMS: Does not the right hon. Gentleman realise that the Labour Party's policy of centralised slaughterhouses is the cause of all this trouble? [HON. MEMBERS: "No."]

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BLOOD MEAL

Lieut.-Colonel CORBETT (December 4th) asked the Minister of Food how much blood meal is available to farmers as a protein food for livestock; and how much is home-made and imported, respectively.

Mr. WEBB: This commodity is free of rationing or any other control and I do not have the information for which the hon. Member asks. Import licences have been granted this year for 5,000 tons.

Lieut.-Colonel CORBETT asked the Minister of Food at how many slaughterhouses arrangements exist and are used for the collection and processing of blood; and what percentage of the total blood of cattle, sheep and pigs, respectively, is saved and processed.

Mr. WEBB: Arrangements for the collection of blood exist at about 400 out of the total of 600 Government slaughterhouses—but only 12 have adjacent processing plants. Separate figures are not kept of cattle, sheep and pig blood saved, but at present about 20 per cent. of the total supply is disposed of for edible and 40 per cent. for inedible purposes.

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CONDEMNED PIG MEAT

Mr. W. SHEPHERD (December 6th) asked the Minister of Food (1) the percentage of pig carcases which last year were found to be infected with tuberculosis; and the percentage which was rendered unfit for human consumption;

(2) the percentage of pig meat which last year was rendered unfit for human consumption as a result of disease; and if he will state the broad categories involved.

Mr. WEBB: Of the pig meat handled by my Department in the last financial year 0·51 per cent. was condemned as unfit for human

consumption on account of disease and other causes, but I cannot say how much of this was the result of tuberculosis. This percentage does not include condemnations of individual cuts of otherwise sound pigs slaughtered at bacon factories, as it would not be practicable for my Department to maintain records of these.

Mr. Shepherd: As about 13 per cent. of pig carcases in some bacon factories are found to be affected by that disease, what steps is the right hon. Gentleman taking to improve the situation?

Mr. Webb: I am not responsible for what happens to the pig before it arrives. A Question should be put down to another Department about it.

ROYAL COLLEGE OF VETERINARY SURGEONS

MEMBERSHIP EXAMINATIONS, DECEMBER, 1950

LIST OF SUCCESSFUL CANDIDATES

London :

First Examination:

One Subject.

Brazier, J. F. H. (B)
Davidson, H. M.
Dubery, B. R. E.
Ernst, F. C.
Hardwick, A. G.
Pigott, R. C. C.
Skone, J. B.

(B) denotes credit in Biology.

Second Examination:

Physiology Only.

Anderson, D. C.
Biggs, P. M.
Bloomberg, J. H.
Box, P. G.
Carter, H. E.
Carter, J. B.
Clay, Daniel
Evans, J. M.
Fell, B. F.
Freudenthal, Gerald
Godfrey, M. J.
Hall, S. A.
Haxby, D. L.
Hooker, Miss P. M. W.
Hunter, F. E.
Jones, J. E.
Jordan, A. N.
Keywood, E. K.
Kirby, M. A.
Lane, D. R.
Mackay, B. H. P.
Malone, J. C.
Martin, H. T. W.
Menard, F. R. J. R.
Morris, A. D.
Pepper, R. T.
Rabbich, P. D.
Reid, J. H.
Richards, M. A. (Credit)
Russell, G. P. (Credit)
Samuel, R. M.
Smith, G. R.
Smith, P. L. F.
Stear, R. T.
Tew, N. C.
Thomas, J. L.
Townsend, G. H.
Walker, Miss G. M.
Watson, K. R.
Wilkins, G. T.
Kiernan, N. S. (Liverpool Student)

Anatomy (including Histology) Only.

Baldwin, I. J.
Basinger, Donald
Dommett, D. J.
Douch, J. A.
Downes, J. E.
Eden, R. M. G.
Fry, N. C. V.
Gillett, T. G. F.
Hambrook, C. L. E.
Keep, M. E.
Morgan, D. B. (Credit)
Nelson, D. G.
Shaw, D. L.
Stockwell, G. D.
Taffs, L. F.
Tuckey, J. B.
Williams, J. R. L. (Credit)

Third Examination:

Pathology Only.

Aitken, Miss E. A.
Barker, G. L.
Boyde, Carl
Boys-Stones, P. A.
Brain, J. R.
Claydon, R. K.
Cook, T. F.
Downie, N. F.
Edwards, T. W.
Evans, D. A.
Evans, H. T. J.
Fishwick, Roy
Gilmore, J. D.
Holton, J. A.
Kennea, T. L.
Lawson, M. R.
Newbery, M. J. E.
Peacock, Ralph
Perrin, Miss P. E. V.
Peters, W. G. D.
Polley, M. J.
Prasad, Y.
Price, M. C.
Sparrow, W. B.
Thomas, H. J. D.
Traynor, D. K.
Thomson, J. McC.
Wallace, H. G.
White, Miss K. S.
Wiggins, G. S.
Williams, W. D.

Hygiene Only.

Ayliffe, J. H.
Bennett, P. H. G.
Bouvet, Roger
Brunsdon, J. R.
Bunting, Miss J. A. (Credit)
Catterall, P. W.
Choudhury, M. U. A.
Clark, J. H.
Clark-Williams, P. R.
Clifford, R. J.
Cook, W. R. (Credit)
Dent, H. H.
Evans, H. L.
Garland, Miss Mary
Haggis, I. H.
Hay, I. F. S.
Howe, W. T.
Jack, J. A. G.
James, T. M.
Jones, W. G. (Credit)
Laing, P. W. (Credit)
Malseed, J. R.
Moore, D. W. W.
Napier, Miss E. E. W.
Neal, N. W.
Needham, N. S.
Norman, J. A.
Orfeur, N. B.
Payne, J. M.
Robinson, J. S.
Rossdale, P. D.
Sherwood, J. E. T.
Shipley, Wm.
Silver, I. A.
Skinner, D. J.
Swift, G. A.
Thuraisingham, S.
Tiedeman, B. G.
Tinsley, Miss P. E.
Walter, W. H.
Wheeler, J. M.
Wilkinson, J. S.
Wiltshire, L. V.
Wood, K. H. B.

Final Examination (Old Syllabus).

Holmes, R. H.
Thomas, T. G.

Final Examination (Revised Syllabus).

Bateson, W. B.
Beach, J. E.
Bongard, A. L.
Burman, Peter
Corder, John
Cox, Gordon
de Gruchy, P. H.
Gibson, Miss M. A.
Gregory, B. M.
Griffiths, A. V.
Heath, J. S.
Jacques, P. A. (M)
Jenkins, P. A.
Minson, Miss J. M.
Morgan T. L. A.
Owen, D. C.
Pittaway, E. M. (M)
Sherlock, B. C.
Spurry, J. R.
Symons, G. B.
Tuckett, P. L.

(M) denotes credit in Medicine.

(To be continued).

NOTES AND NEWS

Diary of Events

Dec. 19th.—Meeting of the Agriculture Group, Society of Chemical Industry, in the Chemistry Lecture Theatre of the Royal College of Science, S.W.7. (Dr. H. H. Green and Dr. Ruth Allcroft, both of the Veterinary Laboratory, Weybridge: "Copper-Molybdenum Relationships in Disorders of Ruminants.")

Jan. 10th, 11th, 12th, 1951.—Meetings of Committees and Council, R.C.V.S.

Jan. 27th.—Meeting of the British Association of Allergists, at the Royal Society of Medicine, 1, Wimpole Street, W.1, 2.30 p.m. (Discussion on Veterinary and Comparative Allergy).

Jan. 31st.—Royal (Dick) Veterinary College Annual Ball, in the Assembly Rooms, George Street, Edinburgh, 8.30 p.m.

QUARTERLY MEETINGS OF COUNCIL AND STANDING COMMITTEES N.V.M.A. DURING 1951

The following dates have been fixed for meetings next year, chiefly to give members plenty of time to reserve hotel accommodation

In London

Monday, January 22nd:

2.30 p.m. Parliamentary and Public Relations Committee.
3.30 p.m. Veterinary State Medicine Committee.

Tuesday, January 23rd:

10 a.m. Home Appointments Committee.
11.30 a.m. Organising Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, January 24th:

11 a.m. Council.

IN LONDON

Monday, April 16th:

2 p.m. Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Tuesday, April 17th:

10 a.m. Veterinary State Medicine Committee.
12 noon Home Appointments Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, April 18th:

11 a.m. Council.

IN EDINBURGH

Wednesday, July 11th:

11 a.m. Home Appointments Committee.
2 p.m. Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 12th:

11 a.m. Veterinary State Medicine Committee.
2 p.m. General Purposes and Finance Committee.

Friday, July 13th:

11 a.m. Council.

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PERSONAL

Conferment of Degree.—At the First Winter Commencements of the University of Dublin (Trinity College), the degree of Doctor in Philosophy was conferred on Laurence Butler O'Moore, M.SC., M.R.C.V.S., of the Veterinary Research Laboratory, Department of Agriculture, Thorndale, Dublin. The subject of Mr. O'Moore's thesis was "Observations on Phosphorus Deficiency in the Grazing Cow."

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Births.—FARRELL.—On November 28th, 1950, at Ashbank, Race Road, Bathgate, to Fay, wife of Adam V. Farrell, M.R.C.V.S., a daughter.

HARTLEY.—On December 7th, 1950, at Venables, Steep Marsh, Petersfield, to Anne (*née* Wootten) wife of Richard Wentworth Hartley, a son.

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Forthcoming Marriage.—STEVEN—SKINNER.—The engagement is announced between Henry John, eldest son of Mr. and Mrs. J. Steven of Force Green, Westerham, and Shirley Joan Compton, only daughter of Mr. and Mrs. Compton Skinner of Plovers, Westerham, Kent.

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Will.—Capt. Arthur Leonard Wilson, M.R.C.V.S., of 5a, Liverpool Gardens, formerly of 83, Brook Street, Kennington, London, late veterinary surgeon to the Southern Railway, who died on July 26th last, aged 79, left £2,775 10s. gross, £2,736 18s. 1d. net value.

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LEGAL NOTES

FAILURE OF CLAIM FOR DAMAGES FOR ALLEGED NEGLIGENCE

Once again the value of membership of the National Veterinary Benevolent and Mutual Defence Society has been demonstrated by a recent case in which a veterinary surgeon was unsuccessfully sued for £150 damages for alleged negligence in treating a dog.

This dog had been inoculated against distemper by the defendant. Some time after this he was called to see the dog, which was then found to be suffering from a primary conjunctivitis. Nine days later this condition was found to be almost completely resolved and for the next seven weeks the dog was thought, by the owner, to be perfectly healthy. At the end of this time, however, the dog developed colitis, marked diarrhoea, acute conjunctivitis in both eyes and pyrexia, and over the next month its condition deteriorated until finally it died.

Plaintiff's case was based on a tardy diagnosis of hard pad disease, it being maintained that this should have been recognised on the earlier visits. Expert evidence was, however, that the dog could not possibly have been incubating hard pad disease at the time when it was stated to have been suffering from conjunctivitis.

Judgment.—The judge stated that the defendant had diagnosed the disease as hard pad disease at a reasonably early time in the course of the disease, and that the plaintiff's wife was aware of this.

The judge was unable to find that the defendant did anything which was negligent. As a result he found that the case failed and gave judgment together with costs to the defendant.

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The following letter has been received by Major Hopkin from the defendant:—

Dear Sirs,

I wish to express my very grateful thanks for the efficient manner in which the recent lawsuit in which I was involved was conducted. Without this thoroughness I feel sure the ultimate result could have been far less happy.

The Society is one the profession can be proud of.

Yours faithfully,
(Signed).

The following is a copy of the letter from the Society's solicitors:—

Dear Sir,

We are pleased to report that we have been able to recover from the Plaintiff, a sum of £72 in respect of costs, being as to £30 costs and £42 disbursements. In addition the Plaintiff has had to pay his own Solicitors' costs which will be more than £72 so that altogether this case will have cost the Plaintiff something like £172 which costs would have had to be borne by your Members, in addition to the damages of £150 if the action had not been successful. We mention these figures to you because we have no doubt they will be of interest to your Committee and to Members of the Society.

You will appreciate that in these County Court cases, particularly where we are working through London agents, we cannot, on taxation of the costs, recover all the costs from the unsuccessful party: for example, we cannot recover from him any of the costs of correspondence with you and with your Members. We are, therefore, enclosing a short note of charges which were not recoverable and which we trust you will find satisfactory.

Yours faithfully,

Note.—The Society wish to emphasise that it is essential that wherever any legal action or claim is possible, the Member should under no circumstances disclose that he is a Member of the Society, or that he is covered in any way by any form of insurance. If any Member should unfortunately be involved or threatened with any action or claim, he should take no action whatsoever without first consulting the Society, excepting denying liability.

. . . . . .

Former Huntsman's Appeal Dismissed.—West Kent Appeals Committee at Maidstone recently dismissed the appeal of Edward Albert Young, 51, of Rudgwick, near Horsham, formerly huntsman of the West Kent Foxhounds. (*Vet. Rec.* **62.** 631.) Young appealed against conviction by the Sevenoaks Justices, who fined him £15 and ordered him to pay £7 7s. costs for causing unnecessary suffering to ten foxhounds by confining them for an undue length of time in a vehicle under unsuitable conditions. Nine hounds were said to have died from suffocation and one died soon afterwards.

The Chairman (Mr. Gerald Thesiger, K.C.) said he did not think that Young intended to be cruel, but he had acted unreasonably.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

SWINE FEVER:

Clackmannanshire.—11 Sauchie Village, Sauchie, Clackmannanshire (Dec. 4th).

Derbyshire.—Home Farm, Kedleston, Derby; The Hayes, Bretby Lane, Repton (Dec. 8th)

Dumbarton.—Gowdenview, Duntocher, Glasgow (Dec. 4th).

Dumfries.—Summerfield, Hoddon, Ecclefechan, Dumfries (Dec. 7th.)

Lanarks.—8, Western Boghead, Lenzie, Lanark (Dec. 7th).

Lincs (Lindsey).—10a, New Wybeck Allotment, Normanby Road, Scunthorpe (Dec. 6th).

Midlothian.—Limekilns East Calder, Midlothian (Dec. 6th.)

Notts.—Sookholme Hall Cottage, Sookholme Lane, Mansfield Woodhouse, Notts. (Dec. 4th).

Stirling.—Cornton Lea West, Bridge of Allan; Burnside, Shieldhill, Falkirk (Dec. 8th).

Surrey.—Brook Farm, Marsh Lane, New Malden (Dec. 6th).

Yorks (*E.R.*).—Old Hall, Anlaby, Hawksworth Hall (Dec. 7th). *Yorks* (*N.R.*).—Lastingham Grange, Lastingham, York (Dec. 5th). *Yorks* (*W.R.*).—Hanover Street, Wakefield, Yorks (Carcase at City Abattoir), 113, Gelderd Road, Leeds, 11 (I&P., 10, Brown Lane Allotments, Leeds, 11); The Bungalow, Thorpe Lane, Tingley, Wakefield, Yorks (Dec. 4th); 24, Northgate, Tickhill, Doncaster (Dec. 5th); The Limes, Sunderland Street, Tickhill, Doncaster (Dec. 6th); Humber Grange Farm, Roxington, Doncaster (Dec. 7th); Southview Farm, Baghill, Pontefract; 213, Carr House Road, Allotments, Doncaster; Royde's Farm, Gowthorpe, Ossett (Dec. 9th).

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V.V.B.F. COUNTY OF AYR LADIES' GUILD

A dance, under the auspices of the above, was held at Western House, Ayr, on November 7th.

During the evening several dance prizes, which had been kindly donated, were presented to the winners.

The result of the dance is that a cheque for £101 8s. has been forwarded by Mrs. Q. A. Stewart to Mrs. W. M. Mitchell, Edinburgh, as a donation to the V.V.B.F. 1950 Christmas Fund from County of Ayr Ladies' Guild.

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UNITED STATES GOVERNMENT RESEARCH AND TRAVEL GRANTS

The United States Government announces that there are now available grants in dollars to assist faculty members at the university level, advanced scholars, and research workers to visit the United States for the purpose of research or teaching in the year 1951-52. Applications will be accepted in the following fields of study: American Studies (history, economics, government), Education, Science and Technology, American Literature and Journalism, Administration and Management. The grants will vary in amount according to the needs of the individual applicant, any dollar resources of the applicant being taken into account. Every grant will be calculated to assist the candidate to maintain an adequate standard of living. Grants will be awarded for a term of study of not less than six months but preferably of 12 months. Expenses of travel between the United Kingdom and the United States may be met by travel grants administered by the United States Educational Commission in the United Kingdom. Application for a lecture or research grant will also constitute application for a travel grant, and will be referred to the United States Educational Commission in the United Kingdom for consideration.

To be eligible for an award the candidate must be a British subject resident in the United Kingdom. The selecting committees will award the grants on the basis of evidence as to character and scholarly achievement, as shown in the applications, the academic record and the plan of study proposed by the applicant. As part of the application for an award each applicant will be required to prepare a plan for study or a specific project which can be materially assisted by a period of from six months to a year in the United States as a research scholar or teacher. It is expected that the applicant will establish his own affiliation with an American university or research institution.

Application forms may be obtained from the United States Cultural Office, Room 22, 5, Grosvenor Square, London, W.1. The closing date for the receipt of applications is January 15th, 1951.

Fulbright Travel Grants

The United States Educational Commission in the United Kingdom announces that, under the provisions of the Fulbright Programme, travel grants are available to citizens of the United Kingdom and Colonies to go to America for an academic or educational purpose, such as study, research, lecturing or the pursuance of other educational activities.

The basic criteria for award of a travel grant are as follows:—

(a) The applicant must possess a guarantee of financial support in dollars for the proposed period of his stay in America.

(b) Graduate students must show proof of admission to an American institution of higher learning. All applicants whatever their programme in America must be definitely affiliated with such an institution. Applications may be made by candidates who have not yet concluded the above financial and institutional arrangements.

(c) Graduate students must intend to spend an academic year of nine months in the United States. Professors, lecturers and senior research workers must intend to spend at least three months in the United States. No exceptions to these regulations will be made this year. Grants cannot be given for attendance at conferences alone.

(d) All applicants must be citizens of the United Kingdom or Colonies.

These travel grants are available for travel to America between June 1st, 1951, and May 31st, 1952. All travel grants will cover the cost of return rail and steamship fares between the candidate's home in the United Kingdom or Colonies and the destination in America. No allowances are made for dependants' travel.

The awards are competitive and applications with proof of university affiliation and dollar support must be submitted by the following dates: by March 31st, 1951—those travelling between June 1st and July 31st, 1951; by July 1st, 1951—those travelling after August 1st, 1951. In all cases applications should be submitted at least two months before the intended date of departure from the United Kingdom.

Since the funds of the Commission are in non-convertible sterling it is not possible to offer grants for maintenance, tuition or incidental expenses within the United States.

All those wishing to apply should write immediately to the United States Educational Commission in the United Kingdom, 55, Upper Brook Street, London, W.1, asking for a preliminary application card. As soon as candidates have completed the university affiliation and financial support requirements they should request the full application forms. No application will be considered until both the preliminary card and the full length forms have been submitted.

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ENGLISH PROFESSORS LECTURE IN HANOVER

(Contributed from Hanover)

In the summer term of 1950, Dr. A. W. Stableforth, of the Veterinary Laboratory, Weybridge, and Professor J. G. Wright, of the Liverpool School of Veterinary Science, gave several lectures to the Veterinary High School, Hanover, at the invitation of the Rector and Senate. Dr. Stableforth, who gave two lectures in German on "Animal Disease in England" and "Mastitis in the Cow," impressed his hearers by relating his own experiences in animal disease control. His remarks on bovine mastitis and penicillin therapy in streptococcal mastitis were a valuable lesson in methods of examination and in the economic results of a systematic control of disease.

Professor Wright gave two lectures on the ovarian cycle and its significance in sterility. He also demonstrated the method of anaesthesia in the horse most commonly used in England, and operation for the removal of foreign body in the bovine. He demonstrated thereby not only a convincing and practical surgical technique but also the fact that a lively lecture delivered by a foreign Professor in his mother tongue and unaffected in its essentials by interpretation can hold the attention and interest of an audience of German hearers in just the same way as this lecturer is well known to do in his own country.

Apart from the scientific success of these contributions, the two lecturers thus re-established the connections between the Veterinary Schools of the two countries which had been severed by the war. For this, the Rector, Professor Dr. Henkels, expressed the warm thanks of the students and Professors of his High School.

* * * * *

MINISTRY'S TUBERCULOSIS ERADICATION SCHEME AND THE IMPORTATION OF IRISH CATTLE

"Steps recommended by a sub-committee as a means of reducing bovine tuberculosis were approved in Edinburgh yesterday by the directors of the Royal Highland and Agricultural Society," states the *Glasgow Herald* in its issue of November 30th, and continues: "The committee believed that the main problems arising in the administration of the Ministry of Agriculture's scheme, which began on October 1st, would be in connection with the importation of Irish cattle. They recommended that all Irish cattle should be subjected to the intradermal test on landing in this country, and should then be isolated and tested again in 60 days. They also believed that the proposed extension from one to three years between herd tests was too long, and recommended that annual tests should continue until the scheme was properly under way.

"The committee considered that the Ministry of Agriculture should clarify the proposals with regard to agricultural shows, with special reference to attested stock shows in a non-attested area."

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

AN ERUPTIVE CONDITION AFFECTING MUCOUS SURFACES IN DOGS

Sir,—We should like to draw attention to a condition in dogs which in our experience is becoming increasingly common in our practices during the last two or three years. We have no idea of the importance, clinical significance, or etiology of the condition described but feel that it is worthy of note and investigation.

We refer to an eruption, papular or vesicular in nature, found on certain mucous surfaces in dogs which may or may not be showing clinical evidence of the condition. The predilection site is undoubtedly the bulb of the penis, and complete extrusion of that organ is essential to detection of the lesions; the lesions have an approximate diameter of 1/32 to $\frac{1}{8}$ in., varying in number from two or three scattered papules to a confluent mass giving the affected mucosa a moist, granular appearance. An individual lesion may be merely a raised, reddened papule, or it may have a minute bleeding ulcerating centre, or be vesicular in type having a tiny central bleb of clear serous fluid—in other words, all the stages of a pox infection. The second common site is the rectal mucosa, in which situation the papules can be detected by digital exploration (without a surgical finger-stall); in the few cases examined endoscopically the lesions here have been papular and non-vesicular in type. Lesions have also been seen on the mucosa of the gum and cheek, but this appears to be exceptional. It is true to say that if lesions are found in either of the latter sites they are also invariably present on the penis, but in many cases penile lesions are present without detectable ones in any other organ.

At first, two of us (M. J. F. and J. O. J.) associated this condition with the convalescent or recovery period of a virus infection, usually "hard pad" disease, but we are now of the opinion that while common in such cases it is frequently also found in dogs having no evidence of virus infection or, in fact, other departure from normal. The curious feature is that while some dogs show obvious signs of the condition others may be severely affected without giving any evidence of it, the lesions being noticed quite accidentally during the course of some other examination.

The main symptom seems to be irritation, dogs with penile lesions licking the prepuce frequently although there may not invariably be much discharge; a few cases have shown haemorrhage (in one case very severe), and two cases of priapism may have been caused by this condition. Rectal cases show all the signs of acute anal gland irritation, but examination and treatment of the anal sacs does not alleviate the distress. One of us (J. O. J.) has recently attributed a case of persistent diarrhoea tentatively to this condition, in the belief that lesions extend upwards into the colon giving rise virtually to a colitis.

Very little is noted in the way of systemic symptoms although some owners have commented on an improvement in general health following treatment.

The condition, once established, shows little tendency to progress or regress without the intervention of intercurrent illness or treatment. We wonder how many apparently normal dogs show the infection.

Penicillin is effective, usually as a local application, but parenterally when necessary. Local anaesthetic suppositories may be helpful in allaying rectal irritation. Intra-mammary penicillin is ideal for treatment of penile cases.

We do not believe that the condition is serious, but believe it to be fairly widespread and to be the cause of some obscure cases of irritation; we feel it is undoubtedly worthy of investigation and would ask our pathologist colleagues if they are familiar with the condition described, and if so, what is the causal organism—bacterial or viral? In spite of the predilection site we do not consider the condition to be a venereal infection since many of the infected dogs have not had any opportunity for contact with the opposite sex.

We would welcome any comment on this condition.

Yours faithfully,

P. L. Builder, Edgware.
Marion J. Freak, Potters Bar.
Joan O. Joshua, Finchley.

December 8th, 1950.

ON THE NATURE OF FOWL PLAGUE VIRUS

Sir,—Writing in *Veterinaria* in June, 1950, Sventzov makes the following statements on the nature of the fowl plague virus:

1. That viewed under special high-powered microscopes the virus is seen to be flagellate in form and have the appearance of a spermatozoon.
2. That cultures of the virus may be grown artificially.
3. That in culture the virus takes on a bacterial form.
4. That in culture and *in vivo* the bacterial form of the virus undergoes a number of morphological changes, passing from Gram positive cocci through various bacterial forms until it becomes Gram positive fat short rods which lie singly or in pairs at an angle.
5. That the virus may be obtained in a crystalline form and that both the ultra-visible flagellate type and the bacterial form of the virus may be obtained from these crystals.

As far as I am aware, all these statements, with the possible exclusion of the first, are of a completely revolutionary nature and run counter to all accepted biological teaching and the teaching on the nature of viruses and the properties of bacteria. To my mind, therefore, it is all the more regrettable that no details are given in the article on the precise methods by which these extraordinary metamorphoses were brought about, and that the author should have contented himself with making a number of bald statements. It would, for example, have been of the highest interest to know the type of culture media employed in the experiments and the exact methods followed in the production of the virus crystals: the appearance, analysis and chemical reactions of these crystals also would seem to be of outstanding importance, since if it is true that viruses may be reduced to inert chemical substances it would seem as though new lines of prophylactic and therapeutic treatment may be open to us.

The thought underlying this research is of course plain: that "life" may be followed down through bacteria and viruses to inert substances: and that in response to certain unspecified stimuli inert substances are being endowed with life every day.

Yours faithfully,

Sapperton, Near Cirencester, Glos.
R. H. A. Merlen.

December 3rd, 1950.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Fowl Pest	Parasitic Mange*	Sheep Scab	Swine Fever
Oct 16th to 31st, 1950	12	—	4	—	2	32
Corresponding period in—						
1949	18	—	55	—	—	—
1948	9	—	2	—	—	1
1947	6	—	392	—	8	2
Jan. 1st to Oct 31st, 1950	297	20	107	—	23	242
Corresponding period in—						
1949	195	13	510	—	34	5
1948	93	2	252	1	52	25
1947	97	103	1400	1	74	31

Note.—The figures for the current year are approximate only.

* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at October 31st, 1950, was as follows:—

England	Wales	Scotland	Total (Great Britain)
24,594	15,306	13,327	53,227